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Tubal Gestation: A Pathological Study.

BY

COMYNS BERKELEY, B.A., M.B., B.C. (Cantab), M.R.C.P., *Lecturer on Midwifery and Assistant Obstetric Physician to the Middlesex Hospital; Senior Physician to Out-Patients, Chelsea Hospital for Women.*

AND

VICTOR BONNEY, M.S., M.D., B.Sc. (Lond.), F.R.C.S., M.R.C.P., *Lecturer on Practical Midwifery and Obstetric Tutor to the Middlesex Hospital; Physician to Out-Patients, Chelsea Hospital for Women.*

[*From the Clinical Research Department of the Middlesex Hospital.*]

HISTORICAL.

THE first recorded case of extra-uterine gestation occurs in the writing of Albucasis in the eleventh century. The author states that an abscess formed at the umbilicus, from which fœtal bones extruded, in a patient in whose uterus the fœtus had died:—

"Ego quondam vidi mulierem, quæ gravida fuerat, fœtus in utero ejus moriebatur, deinde alia insuper vice gravida facta est deinde moriebatur fœtas ille alter etiam et accedit illi post longam tempus tumor in umbilico ejus qui inflatus fuit donec aperuit et pus produxit. Ex loco egreditur os; deinde præterierunt dies aliquot et egreditur os alterum. Ego igitur opinabar, hæc esse ex ossibus fœtus mortui. Vulnus igiter investigavi, et ex illo ossa multa extraxi; mulier autem optime se habuit, adeoque vixit illo modo longum tempus, pauco pure ex illo locoproducti."—Lib. ii., sec. 74.

The next case would appear to be recorded by Polinus, 1531, but will not bear critical investigation. The patient at her tenth pregnancy developed an abscess in her left hypochondrium, which

bursting permitted the exit of a living male child; the mother died on the third day in great agony.

In the early half of the sixteenth century Cornax dilated an ulcer near the umbilicus, and extracted therefrom a semi-putrid fœtus which had been retained for five years. ("Suc. Ess. Hist., sur les accouch.," Vol. ii., p. 61.)

A case is mentioned by Felix Platerus occurring in the concubine of a member of one of the sacerdotal orders, in which, after labour pains had continued for eight days and then subsided without delivery, a swelling appeared at the umbilicus from which a dead fœtus was extracted. (Felix Platerus "De partium corporis," etc., 1597.)

Cordæus, who lived at the same time as Platerus, records a case where a patient remained unfruitful till she was 40 years of age. She then became pregnant, but labour pains passed off without a child being born; at the age of 71 she died, and a lithopædion was found in her abdomen. (Cordax "Comment. in librum priorem Hippocrat de Mulieribus," p. 740.)

Horstius published in 1563 a case of spurious labour occurring in 1549. The patient still retained the fœtus at the date of his writing. (Horstius oper., Med. Lib. xi., p. 504.)

Primrose in 1595 (Primrosii Morb., Mul. Lib. iv., p. 316) and Hildanus (Fabricius Hildanus, p. 908) reported similar cases.

Riolanus (Riolan. Fil. anthropogr., Lib. ii.) was the first to definitely describe a case in which the fœtus was found in the Fallopian tube. This occurred in 1604, and he recorded a similar case in 1638.

Since this many cases have been reported from time to time, but even up to 1876 the condition was apparently thought to be a very rare one. Hennig ("Die Krankheiten der Eileiter und die Tubenschwangerschaft. Stuttgart," 1876) stated that even the directors of large obstetrical institutions might never meet with a case, and Parry in 1876 could only collect 500 cases from the literature dealing with the subject up to that time.

It remained for Lawson Tait in 1883 to expand our knowledge of this subject by operating on a case of tubal rupture, thus bringing the condition within the domain of abdominal surgery.

Hermann in 1890 first diagnosed a case of tubal pregnancy before rupture and operated upon it. Since then very great advances have been made in our knowledge, not only in diagnosis and treatment, but also as regards the pathology of the condition.

Up to 1898 the developing ovum was held to be situated in the

lumen of the tube, but since that date the work published by many observers on the method of implantation of the intra-uterine ovum, together with more accurate microscopical study of the pregnant tube, has led to the discovery that the tubal ovum is situated, not in the lumen of the Fallopian tube, but in a sac in the wall of the tube.

Fürth first described in 1898 a two-and-a-half weeks' tubal gestation in which the developing ovum lay entirely outside the lumen of the tube, being separated from it by a thin layer of muscular tissue, but the occurrence was not then recognised as being a normal one.

Hubrecht in 1889 published a monograph on the placentation of the hedgehog, showing that the developing ovum in this animal, after sequestration in a crypt, becomes imbedded in the sub-epithelial portion of the mucosa of the uterus by the action of the non-fœtal ectodermal cells of the blastocyst. These cells Hubrecht named *Trophoblast* because of their nutritive function, for by their agency the blastocyst "burrows" into the maternal tissues, both destroying and absorbing them.

Similar observations have subsequently been made on bats (Duval), the guinea-pig (V. Spee), the rat and mouse (A. Robinson, Sobotta), all establishing the fact that in these animals the non-fœtal ectoderm of the blastocyst destroys the uterine epithelium, and subsequently the sub-epithelial portion of the mucosa, until the blastocyst comes to lie in a space (implantation space) within the maternal tissue.

In 1899 a very early human ovum (5—7 days) was described by Peters, which demonstrated very clearly that what applied to the ovum of rodents and insectivora was equally applicable to man, viz., that the human ovum was an imbedded one.

Up to this time the intra-uterine implantation of the human ovum had been held to be effected by a surface interlocking of fœtal and maternal tissues similar to that obtaining in the placentæ of ungulates such as the sheep or sow, and the formation of the decidua reflexa had been explained by the upgrowing of mucosal folds around the superficially attached ovum.

"The human blastocyst described by Peters was completely buried in the uterine submucosa.

"The wall of the blastocyst was at its outer part composed of a many-layered cell mass constituting the trophic ectoderm or trophoblast, which was irregularly excavated by blood extravasations from the maternal vessels. The maternal tissues in contact with it appeared to be undergoing degeneration.

"The site of the ovum appeared as a slightly raised convexity projecting into the uterine cavity, and at one point the epithelium was absent, there being here a mass of fibrin marking the spot where the ovum had apparently penetrated the maternal tissue.

"The trophoblast consisted of two kinds of cells—large mononuclear cells and multinuclear syncytia—and between these two types of cell all gradations could be traced.

"Beginning ingrowths into the trophoblast of the chorionic mesoblast could be seen, but no villi were yet formed. The embryo itself resembled that of the hedgehog at a corresponding period of development."

Analogy with the ovum of insectivora and rodents, and the discovery of this unique specimen, together with the work of Selenka and Strähl, on placentation in the anthropoid apes, has established the fact that the human intra-uterine ovum imbeds itself by an active destruction of the mucous membrane of the uterus.

The necessity for obtaining pabulum for the growing ovum is thus met in man by means of destruction and absorption of the maternal tissues on which the ovum is engrafted, until a later period, when the formation of villi by ingrowths of vascular mesoderm into the trophic ectoderm enables the embryo to obtain nutriment by transudatory exchange.

This new view of the behaviour of the impregnated intra-uterine ovum (which has lately been strongly urged in this country by Teacher*) was soon applied to the ovum developing in the Fallopian tube, and the explanation of Fürth's seemingly anomalous case of tubal gestation was made clear by adopting it.

It must be remembered that the mucous membrane of the tube differs from that of the body of the uterus in having practically no submucosa, so that the developing ovum, if it behaves in the tube in a similar manner to that in the uterus, must imbed itself in the muscle on which the columnar epithelium of the tube practically stands.

Werth, Aschoff, Heinsius, Lockyer, William Duncan, and others have all brought forward evidence of the intra-muscular site of the tubal gestation, whilst Russell Andrews' excellent paper on "The Anatomy of the Pregnant Tube"* is responsible for the acceptance of the fact in this country that the early tubal ovum is entirely intramural in position.

But whilst the main fact that the human ovum is an imbedded one is now generally agreed upon by all competent observers, a number of lesser details are still under discussion, both as regards intra-uterine and extra-uterine pregnancy.

* *Journ. of Obstet. and Gynæcol. of the British Empire*, Vol. iv., p. 280.

This is unavoidable, because the very early stages of the developing human ovum, either in the uterus or in the tube, have not been studied, even the specimen described by Peters being comparatively late from an embryological point of view, whilst in the tube the earliest specimen described is of at least 14 days' growth.

The Authors' Specimens.

Our own work on this subject is founded on the macroscopical and microscopical examination of eighteen specimens of early tubal gestation.

Amongst these we are fortunate to include two of 19, one of 24, and one of 30 days' growth. Of these specimens one of the 19-day tubes and the 24-day tube have been cut in serial sections to the number of nearly 6,000. We are indebted to Mr. Murray for both these specimens. The 30-day tube was treated similarly. For the second 19-day tube we are indebted to Dr. W. Duncan, who has already reported the case, together with some pathological notes by one of us, founded on a large number of sections obtained from it. All these four pregnant tubes were specimens of "extra-tubal" rupture, and they were obtained as a result of the operations necessitated thereby.

One patient on admittance to the hospital was nearly dead, and an operation failing to save her life we were enabled to obtain the uterus and adnexa at the *autopsy*.

The two 19-day tubes each presented on the isthmic segment a small globular enlargement about 7 mm. in diameter, in the anti-mesosalpingeal side of which was a perforation about 3 mm. in diameter with clean-cut edges. The ovum had escaped from the sac, but in neither case was found, although a careful examination was made of the blood removed from the peritoneal cavity.

The 24-day tube was similar in all respects except that the enlargement measured 10 mm. in diameter, and that it was situated in the ampullary segment. In neither of these three specimens was there any general distension of the tube.

The 30-day tube presented similar appearances. The gestation was in the ampullary segment. There was, in addition to the extra-tubal rupture, an intra-tubal rupture as well, and the lumen of the tube contained a blood-clot the size of an almond.

The Site of the Tubal Gestation.

The serial sections obtained from our specimens of pregnant tubes of 19 and 24 days' duration entirely confirm the results published by

Fürth, Werth, Aschoff, Heinsius, Lockyer, and Russell Andrews, viz., that the early tubal gestation is entirely intra-mural, and do not support the view of Couvelaire that the tubal ovum is never completely imbedded in the tube wall.

The serial sections obtained from our three early specimens of tubal gestation already referred to yield results so nearly identical that a detailed account of those obtained from one of them will suffice to demonstrate this point.

Fig. 1 illustrates a transverse section of the tube on the abdominal side of the gestation sac and presents nothing abnormal.

It will be seen from the simple arrangement of the plicæ and the relative thickness of the muscle that it is taken from the isthmic portion of the tube. An attentive examination of the section reveals no trace of fœtal cells, either in the tissues or in the vessels.

Fig. 2 illustrates a section taken some 0·7 mm. nearer to the gestation sac. Fœtal cells (trophoblast) are just beginning to appear in the inner portion of the longitudinal (outer) coat of the muscular wall of the tube.

These cells, which from their large size and deeply-stained nuclei strike the eye at once, are lying in and around somewhat crescentic spaces, formed by delaminations of the outer longitudinal muscle coat. The whole tube is thickened, this being partly due to increase in its muscular elements and partly to an appearance of œdematous swelling affecting the connective tissue between the muscle bundles.

It will be noted that the earliest signs of the fœtal cells in this section are on the side towards the mesosalpinx.

Two large arteries cut in transverse section are seen where the tube joins the mesosalpinx.

Fig. 3 illustrates a section taken about a millimetre nearer the centre of the gestation. Evidence of fœtal invasion is here very marked along crescentic delaminations of the muscle wall on the side of attachment to the mesosalpinx. Along these delamintations the trophoblast cells appear to be proceeding in such a way that the walls of the spaces are very deeply infiltrated by them. The maternal tissue in their vicinity is broken up, and is undergoing a fibrinous change. There is little or no evidence of proliferation of the maternal cells or of an active reply of any kind by them to the destructive action of the trophoblast, whose cells are mainly of two kinds—large mononuclear cells and irregular multinuclear syncytia. Here and there are seen multinuclear cells, which are probably to be regarded as intermediate stages between these.

Fig. 4 reproduces the appearances shown by a section taken a millimetre nearer the uterus.

A definite gestation sac is now seen, which lies to one side of the lumen of the tube, chiefly towards the attachment of the mesosalpinx. It is separated from the lumen by the circular coat of muscle.

The wall of the sac is formed by muscular tissue densely infiltrated by trophoblast cells (the " cell-sheet "). The sac surrounds the circular muscle

Note.—Figs. 1 to 9 were drawn, as regards their chief details, with the Camera Lucida. These drawings were then enlarged with the Pantograph. The finer details were then filled in in a semi-diagrammatic manner. Finally, the completed drawings were reduced to their present size, the proportions between them being maintained.

coat for about one-half of its circumference, whilst around the remaining half the trophoblast cells can be traced effecting a delamination of the muscle fibres, and particularly tending to split the longitudinal from the circular muscle coat.

Wherever the maternal tissue is in contact with the cells of the trophoblast, evidence of extensive fibrinous degeneration is met with, the muscle bundles becoming indistinct and homogeneous, and eventually forming layers of somewhat concentrically laminated fibrin.

In the process of invasion zones of muscular tissue appear to become sequestrated both from within and without by masses of trophoblast cells, and subsequently to undergo fibrinous change.

The gestation sac contains many chorionic villi, exhibiting the usual bilaminar epithelium, which in many places can be traced by continuity of cells into the layers of invading trophoblast.

The circular muscle coat appears to resist the fibrinising action of the trophoblast much more successfully than the somewhat loosely-structured longitudinal coat, so that the gestation sac is still separated from the lumen by a considerable thickness of unaltered circular muscle.

Numerous blood extravasations are seen amongst the more peripheral layers of the trophoblast cells.

The method of invasion of the tube wall by the trophoblast appears chiefly to be a process of delamination followed by fibrinisation, and in some places the walls of the maternal vessels are particularly singled out for attack, so that sections of vessels (usually veins) appear in which a large part of the circumference of the wall is replaced by trophoblast cells, the remainder appearing normal.

It is, however, often difficult to distinguish spaces formed by delamination of the muscle fibre from the lumen of veins. This much appears certain, viz., that the trophoblast cells do not grow along the veins, but rather tend to invade them from without, being never found occupying the lumen of blood-vessels, so that the peripheral spread of the trophoblast takes place by an intercalation of fœtal cells between the muscular strata of the tube wall.

Fig. 5 represents a transverse section of the pregnant tube about 1 mm. nearer the uterus.

The gestation sac is now large, and is seen to be surrounding the circular muscle coat in a very remarkable way.

It is evident that the ovum has split the longitudinal coat from the circular coat and is lying between them.

The wall of the sac is composed of fibrinised muscle tissue deeply infiltrated with trophoblast cells.

Within the cavity lie many villi, covered by the usual double layer of epithelium. At a few spots this can be seen to be continuous with the layers of trophoblast cells, which constitute the "cell-sheet."

No villi are found amongst the maternal tissues.

Large masses of syncytium are found here and there, chiefly in relation with the epithelium of the villi, with the inner cellular layer of which, (Langhans' layer) they can be seen to be directly continuous.

Syncytia are always found in a space, either the gestation sac itself or some of the blood spaces which appear to adjoin it.

In many places masses can be seen made up of cells closely united, but yet exhibiting definite cell boundaries.

Probably these represent syncytia in which segmentation of the mass has taken place into definite though as yet unseparated cells.

At one point the circular muscle coat, with its contained tubal lumen, is joined to the separated longitudinal coat by a mass of fibrin with blood extravasations in its substance.

On the side of the tube, opposite the mesosalpinx, the gestation sac is bounded externally by a thin layer of the longitudinal muscle coat, which is extensively infiltrated by the trophoblast, and has undergone fibrinous degeneration throughout almost its whole thickness, the peritoneum alone remaining unaltered.

The lumen of the tube is still separated from the gestation sac by a considerable thickness of circular muscle. The tube itself is dilated and its plicæ have disappeared. The columnar epithelium is more cubical in outline. Within it is seen a plug of fibrin of a circular shape, the periphery of which is made up of a number of small mononucleated cells. In this section the plug appears separated from the epithelium by a space around it. The circular muscle adjoining the gestation sac is fibrinised and infiltrated with trophoblast cells, though as yet to no great depth, except at one point where it has extended more deeply.

FIG. 6 illustrates a section taken a little further up the tube. The general appearances are the same, but the rupture in the wall of the gestation sac is now seen at a point corresponding to the thinned and degenerate portion of the circular muscle noted in the preceding section.

The bulk of the gestation sac is still in the mesosalpingeal half of the tube, although the rupture is in the opposite half.

The lumen of the tube is still occupied by the plug of fibrin, covered externally by scattered mononuclear cells.

FIG. 7 is a transverse section taken through the centre of the rupture in the tube wall. This is seen to be still in the side of the tube opposite the mesosalpinx. The gestation sac is still bounded by layers of laminated fibrin, which can be seen being formed by the degeneration of the longitudinal muscle fibres, whilst partially imbedded *in*, but chiefly *between* them are dense masses of trophoblast cells. Many villi are present in the gestation sac, whilst a large mass of fibrin, into which blood collections have extravasated, is seen on the right hand of the drawing.

The lumen of the tube is crescentic in shape owing to the projection into it of a dense mass of fibrinous mtaerial which is situated in the circular muscle on the mesosalpinx side of this coat. Blood extravasations are found in this mass of fibrin, which appears to be replacing the circular muscle at this point, and extends from the tubal lumen through the circular muscle to the "cell-sheet" that forms the boundary of the gestation sac.

Intermediate sections between this and that last illustrated show that this mass of fibrin projects into the lumen for some considerable distance, at first being sessile on the wall, but later becoming entirely free, so that in FIGS. 5 and 6 it appears as a detached mass in the centre of the lumen.

The cells that cover it, *i.e.*, that intervene between the fibrin itself and the lumen of the tube, we have been at some difficulty in allotting to a definite histological place. They are certainly not epithelial in origin, the tubal epithelium being absent over that part of the tube wall. Nor are they fœtal cells, being much smaller than the trophoblast cells, and having fainter staining nuclei and less definite outline.

We believe them to be cells proliferated from the connective tissue of the tube wall—probably from the scattered sub-epithelial stroma cells noted by Andrews.

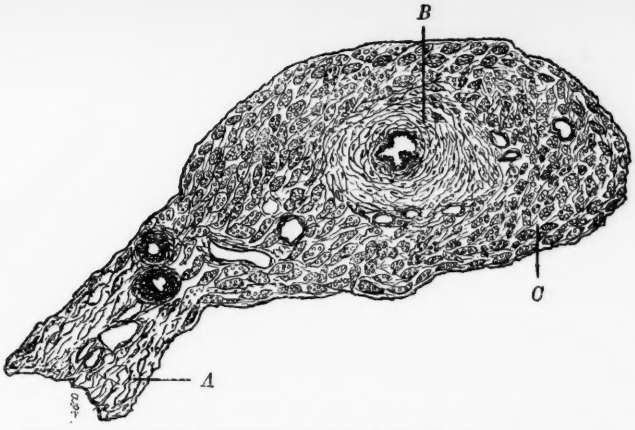

FIG. 1.—TRANSVERSE SECTION OF THE PREGNANT TUBE BETWEEN THE GESTATION SAC AND THE UTERINE CORNU.

It is normal in every respect.

A. Mesosalpinx. *B*. Circular Muscle Coat. *C*. Longitudinal Muscle Coat.

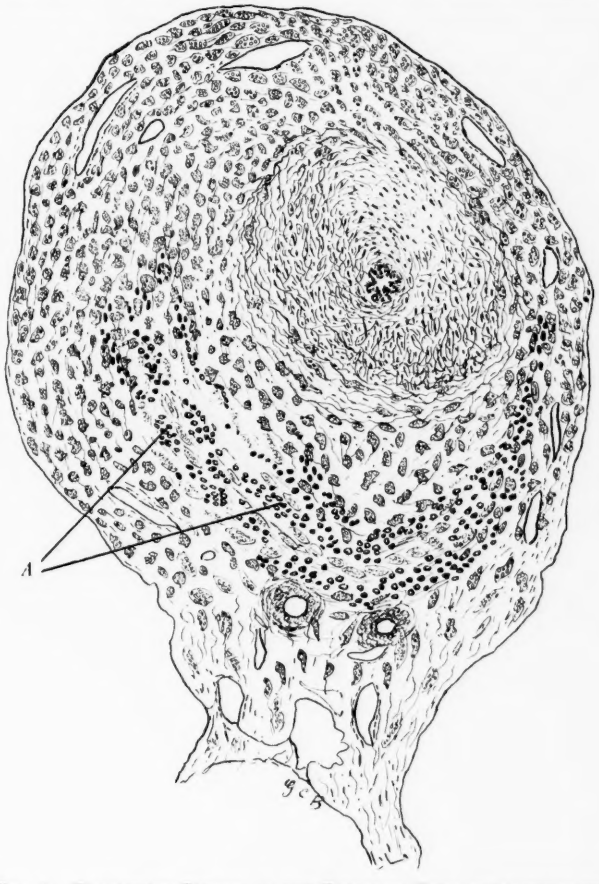

FIG. 2.—TRANSVERSE SECTION OF THE PREGNANT TUBE APPROACHING THE GESTATION SAC.

A. Trophoblast cells invading the longitudinal muscle coat. Note the tendency to concentric delamination of the muscle fibres.

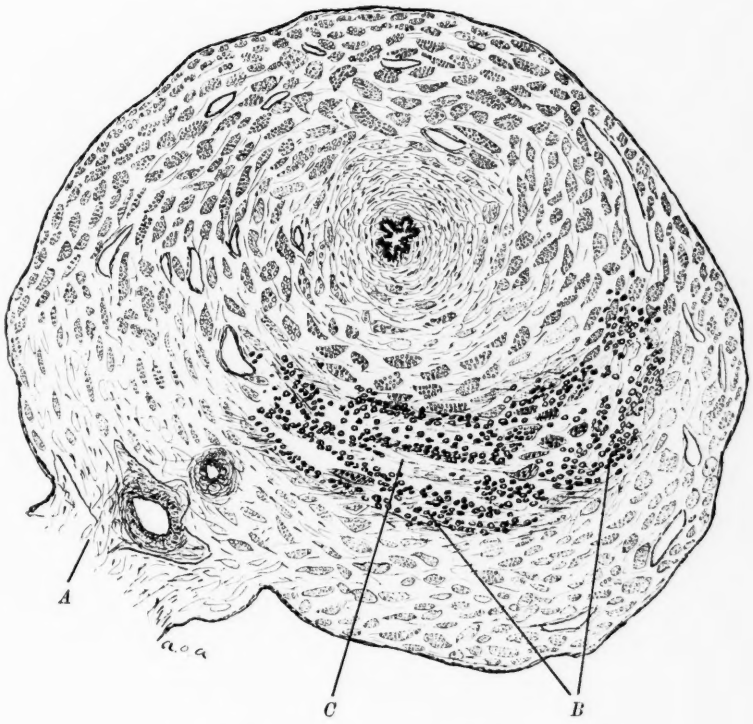

FIG. 3.—TRANSVERSE SECTION OF THE PREGNANT TUBE.

A. Mesosalpinx. *B*. Trophoblastic infiltration. *C*. Muscle fibres undergoing a fibrinoid change.

Spaces are appearing amongst the trophoblast, and syncytia are now seen.

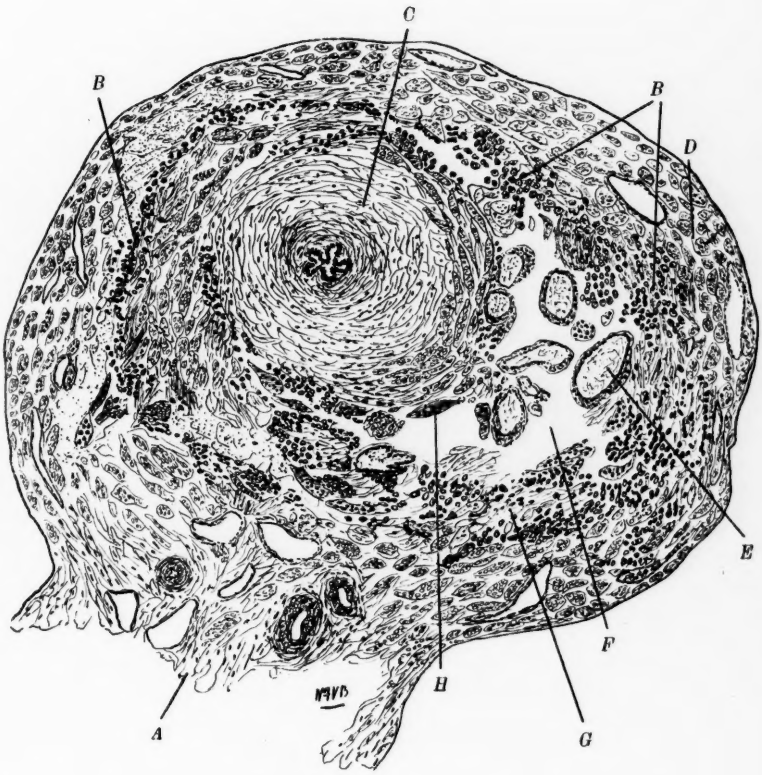

FIG. 4.—TRANSVERSE SECTION OF THE PREGNANT TUBE.

A. Mesosalpinx. *B B*. Cells of the Trophoblast. *C*. Circular muscle coat. *D*. Longitudinal muscle coat. *E*. Villus. *F*. Gestation sac. *G*. Muscle fibres undergoing fibrinoid change. *H*. Syncytium.

The gestation sac, it will be noticed, is bounded by a zone of trophoblast cells and fibrinised muscle constituting the "cell sheet."

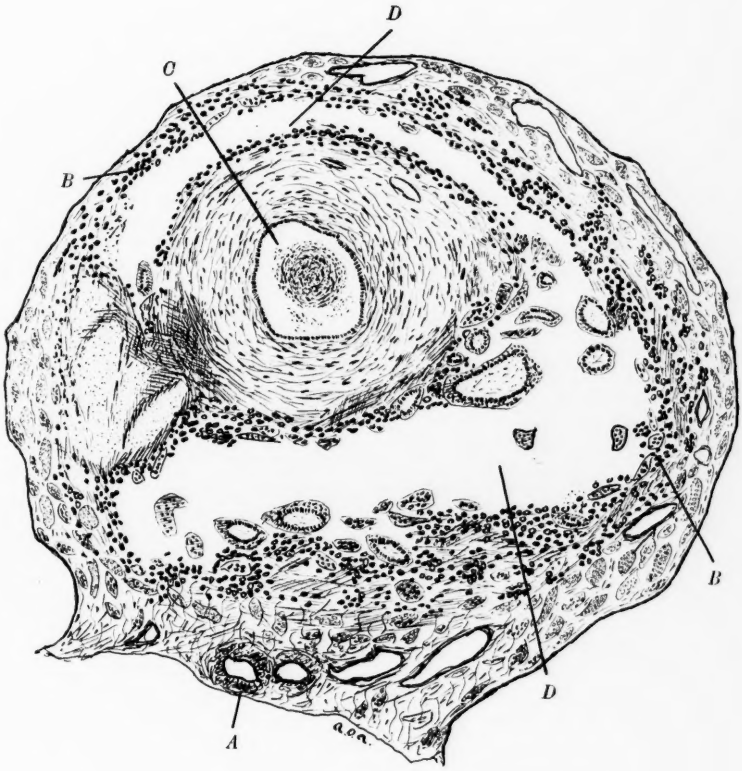

FIG. 5.—TRANSVERSE SECTION OF THE PREGNANT TUBE.

A. Mesosalpinx. *B. B.* "Cell Sheet." *C*. Lumen of Tube distended, and containing a mass of fibrin. *D. D.* Gestation sac.

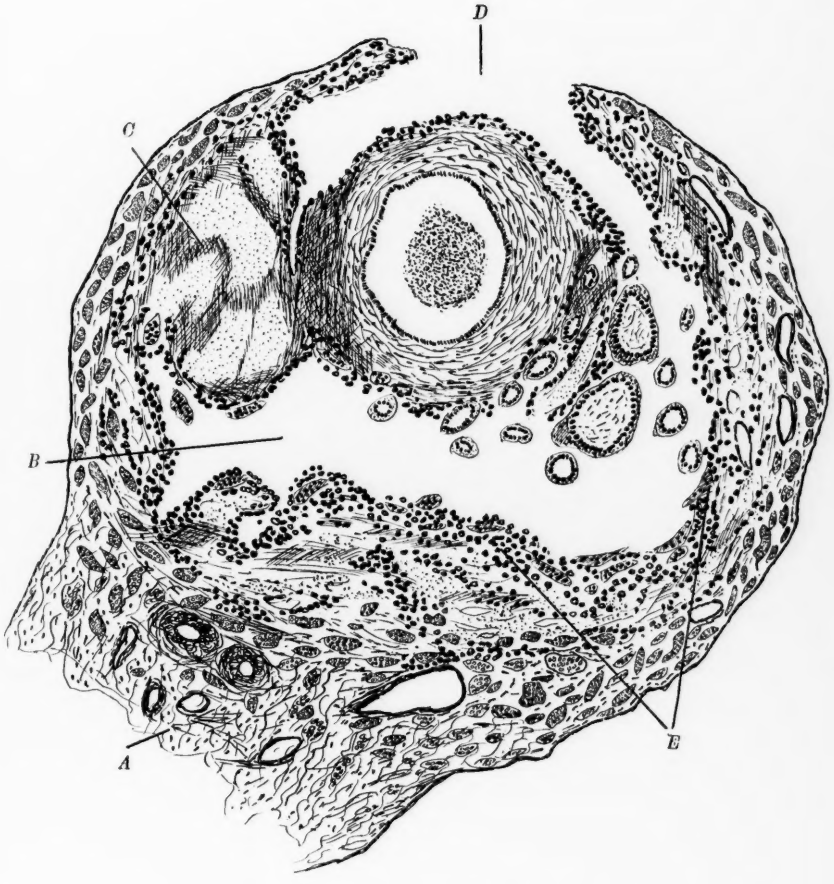

FIG. 6.—TRANSVERSE SECTION OF PREGNANT TUBE.

A. Mesosalpinx. *B*. Gestation sac. *C*. Mass of fibrin, containing blood extravasations. *D*. The rupture in the sac wall. *E*. "Cell Sheet."

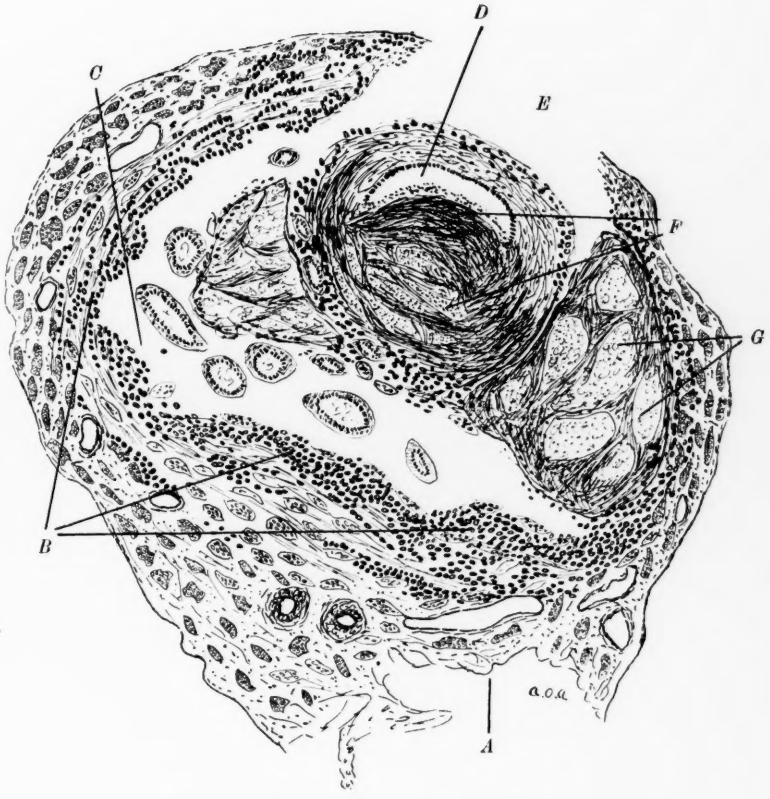

FIG. 7.—TRANSVERSE SECTION OF PREGNANT TUBE.

A. Mesosalpinx. *B*. "Cell Sheet." *C*. Gestation sac. *D*. Lumen of Tube. *E*. Rupture. *F*. Mass of fibrin, representing track of ovum. *G*. Mass of fibrin, containing blood extravasations.

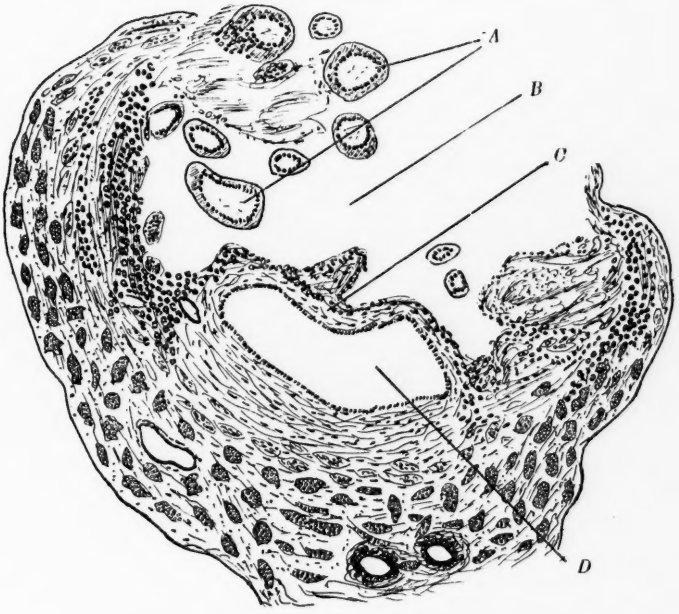

FIG. 8.—TRANSVERSE SECTION OF PREGNANT TUBE.

A. Villi. *B*. Gestation Sac and Rupture. *C*. Capsularis. *D*. Lumen of Tube.

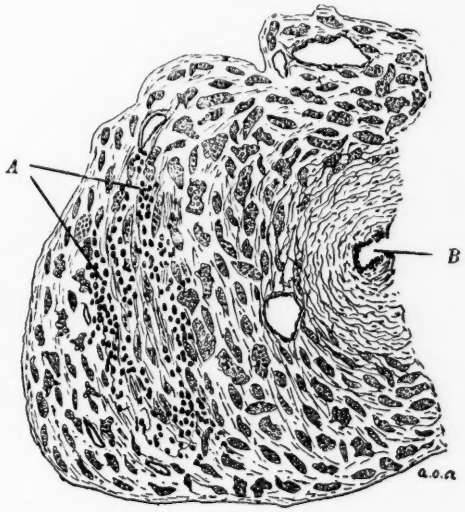

FIG. 9.—TRANSVERSE SECTION OF PREGNANT TUBE.

A. Trophoblast Cells invading Longitudinal Muscle Coat. *B*. Lumen of Tube.

This section being oblique, only a portion of the circumference of the tube is included in it.

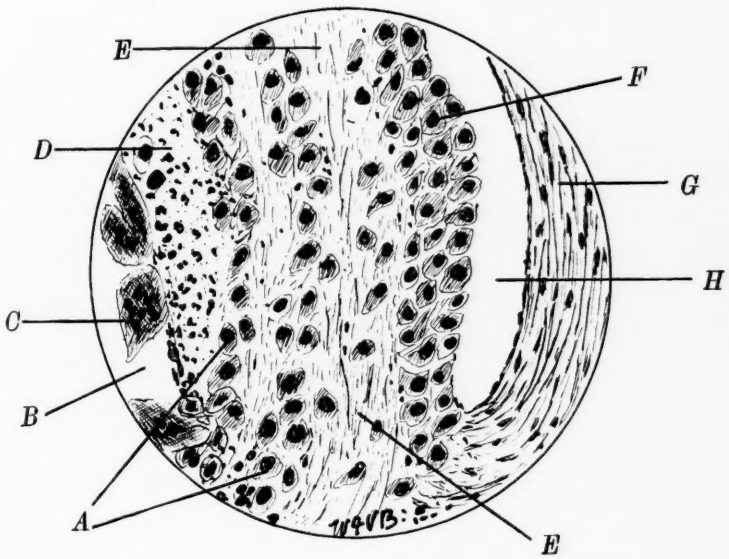

FIG. 10.—A PORTION OF THE "CELL-SHEET," HIGHLY MAGNIFIED.

A. Cells of the Trophoblast. *B*. Gestation sac. *C*. Syncytium. *D*. Fibrin deposited from blood in intervillous space, and containing polynuclear leucocytes. *E*. Muscle undergoing fibrinoid change. *F*. Cells of Trophoblast embryonising wall of maternal vein. *G*. Unaltered vein wall. *H*. Lumen of vein.

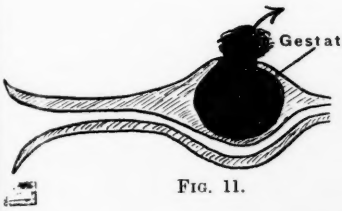

FIG. 11.

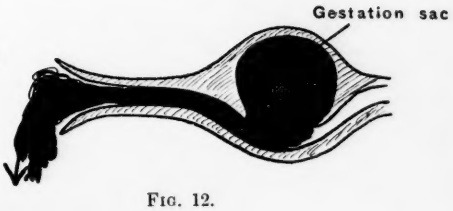

FIG. 12.

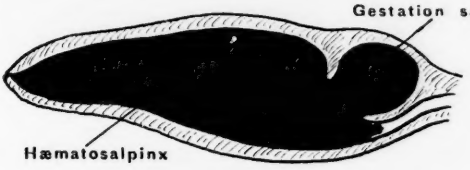

FIG. 13.

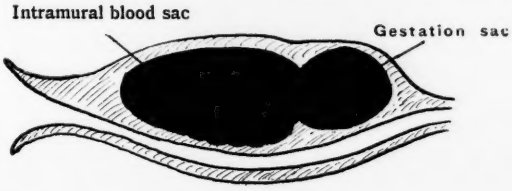

FIG. 14.

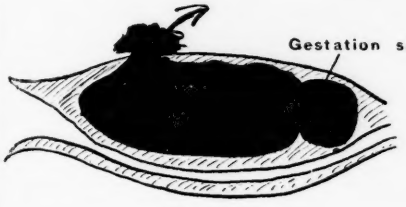

FIG. 15.

FIG. 16.

THE VARIETIES OF RUPTURE OF THE PRIMARY GESTATION SAC.

FIG. 11.—Extra-tubal Rupture. FIG. 12.—Intra-tubal Rupture, with escape of the blood from the abdominal ostium. FIG. 13.—Intra-tubal Rupture, with retention of blood in the tube lumen (Hæmatosalpinx). FIG. 14.—Intra-mural Rupture.

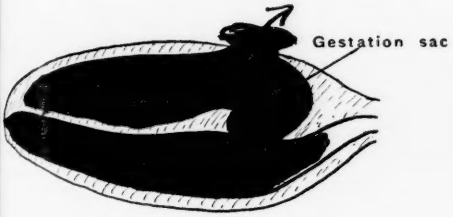

FIG. 18.

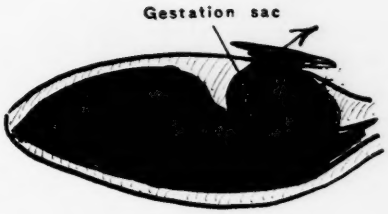

FIG. 19.

FIG. 20.

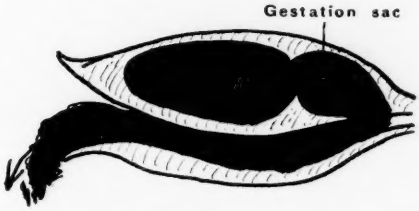

FIG. 21.

FIG. 22.

COMBINED FORMS OF RUPTURE OF THE PRIMARY GESTATION SAC.

FIG. 18.—Combined extra-tubal, intra-tubal, and intra-mural Rupture. FIG. 19.—Combined extra and intra-tubal Rupture. FIG. 20.—Combined extra-tubal and intra-mural Rupture. FIGS. 21 and 22.—Combined intra-mural and intra-tubal Rupture, without and with retention of the blood in the tubal lumen.

If this be so, then these cells might be said to form an attempt at a "Decidua Reflexa," although the term is an objectionable one.

This mass of fibrin evidently marks the track along which the ovum burrowed to reach its intra-muscular site, and it is very interesting to remember that in the early intra-uterine ovum described by Peters a similar plug of fibrin was found at the point where presumably the ovum had burrowed into the submucosa.

FIG. 8, which represents a section taken 1 mm. nearer the uterine end of the tube, shows a similar condition in respect of the relation of the gestation sac to the lumen of the tube, that is to say, it is entirely outside it; but the circular muscle surrounding the tube lumen is now extensively destroyed on the side adjoining the gestation sac, which occupies not the entire circumference of the tube but its antimesosalpingeal half only.

But although the circular muscle is much thinned at this point, definite muscle fibres separate the gestation sac from the tube lumen.

From this point onwards, *i.e.*, towards the uterine end of the tube, the sections show a diminishing amount of fœtal tissue and a gradual restoration of the muscle fibre, until in FIG. 9 we see the structure of the tube almost completely normal, except for masses of invading trophoblast cells, which are insinuating themselves between the layers of the longitudinal muscle coat.

The epithelium covering the tube lumen is quite normal in appearance. Sections taken further on show a tube in every respect normal.

It will be noticed that neither fœtus nor membranes are present, these having escaped on the rupture of the gestation sac.

The sections obtained from our second specimen of 19 days' duration exhibit practically identical features, but since we were unable to cut the entire gestation in serial sections they can only be used to support the results obtained from the first specimen. In so far as they go they entirely concur with these.

The specimen of 24 days' duration shows a more advanced stage in the destructive action of the trophoblast. The gestation had occurred in the ampullary portion of the tube, and the serial sections obtained from it agree with those previously described, in that at *no point does the gestation sac communicate with the lumen of the tube.*

The sections are more complicated and difficult to decipher than those from the earlier tubes, but several points are specially well shown. The epithelium and plicæ of the tube have undergone no pathological change except at one part where, presumably, the ovum had made its way out of the lumen into the muscle tissue. Here is situated a dense mass of fibrin which bulges into the lumen, but in a less marked manner than that seen in the earlier tube illustrated in Figs. 5 to 7. There is no intra-lumenous plug of fibrin, and the tube is neither distended nor is its epithelium flattened, whilst the trophoblastic infiltration of the muscle tissue is very much more extensive, there being but few portions where the invasion has not

occurred. The structure of the "cell sheet" is very well shown. No trace of fœtal rudiments or membranes are seen, these having, as in the previously described specimens, escaped when rupture occurred.

In our fourth specimen, which is of about one month's duration, the gestation has occurred in the ampullary end of the tube close to its junction with the isthmus. The sac is situated in the wall of the tube and has ruptured into the peritoneum through a hole about four inches in circumference. Internally the sac communicates with the lumen of the tube by a large aperture, and in the lumen is a mass of blood-clot showing some chorionic villi on its surface. The gestation sac is empty, and its intramural site is very obvious to the naked eye in this specimen.

The remainder of our specimens of pregnant tubes consist of cases in which rupture of the gestation sac with blood extravasation has occurred, forming varieties of hæmatosalpinx. In such specimens there is often difficulty in ascertaining the exact location of the gestation sac, as the tube is much disorganised by the blood extravasation; nevertheless, in those in which it has not been so destroyed by hæmorrhage as to be unrecognisable, it is obvious that the gestation sac lies without the lumen of the tube.

Decidua Formation in Tubal Gestation.

There has been much dispute in the past as to whether the pregnant tube forms a decidua in any way comparable to that of intra-uterine pregnancy. In the healthy tube there is practically no submucosa, the epithelium standing on the circular muscle coat directly. There is therefore, at the outset, a great difference from the anatomical conditions obtaining in the uterus. Russell Andrews has described a sub-epithelial stroma in tubes the subject of chronic salpingitis, but these are the least likely to become the seat of a pregnancy.

The term "decidua" can in tubal pregnancy be applied in three ways:—

1. *In the sense of a definite massive proliferation of a (supposed) sub-epithelial stroma causing a decidual hypertrophy of the tubal mucous membrane analogous to that occurring in the uterine mucosa.*

Such a condition is described by Orthmann, C. Webster, Whitridge-Williams, and others, and the two latter authors describe it in the opposite tube as well. In our specimens no such proliferation is present, unless it be represented by the scattered cells which surround the fibrinous plug.

2. *In the sense of a "decidua capsularis" separating the ovum from the tube lumen, just as the decidua capsularis (reflexa) separates the intra-uterine ovum from the cavity of the uterus.*

It is obvious that the muscle tissue intervening between the gestation sac and the tube lumen is in respect of the manner in which it has come to obtain that relation strictly comparable with the decidua reflexa of the uterus. There, however, the likeness ends.

In none of our specimens did this layer show any cell proliferation, but rather a tendency to degeneration, nor did it on account of the small size of the tube tend to bulge into the lumen.

Indeed, as can be seen by reference to the drawings, the gestation sac or implantation space in our earliest specimen extends right round the tube lumen, so that if we wished to define a decidua simply by homology of position with that in intra-uterine pregnancy it would be very difficult to know whether to describe the circular muscle separating the lumen from the gestation sac as reflexa or vera.

We think, therefore, that the term decidua should not be used in this sense.

3. *In the sense of a proliferative reaction of the connective-tissue cells of the wall of the tube irrespective of their position.*

The term "decidua" appears to be used by most modern writers in this sense.

Thus Russell Andrews describes isolated decidual cells in the folds between the plicæ, and decidua-like cells scattered irregularly over other parts of the tube wall, but we agree with him that such cells do not merit the term "decidua" when taken *en masse*.

In our sections the absence of connective-tissue reaction to the invading trophoblast is, perhaps, one of the most striking features. Here and there are patches of small cells with single rounded deeply-staining nuclei, whilst scattered irregularly about in the muscle tissue are certain cells with large oval vesicular-looking nuclei which stain faintly with hæmatoxylin. These cells are certainly decidua-like and are apparently also described by Teacher as occurring in the uterine wall, the seat of *chorion-epithelioma*, but with the exception of these the maternal tissues appear to be undergoing a passive destruction.

Decidual cells have been described by many authors as occurring in the ovary, the opposite tube, and the peritoneum, but we have been unable to find them.

Method of Imbedding of the Ovum in Tubal Gestation.

In certain insectivores (Erinaceus) and myomorphic rodents the

ovum becomes sequestered in a crypt in the uterine mucosa, the mouth of which subsequently closes over it. The ovum subsequently grows at the expense of the maternal tissues surrounding it, which it destroys.

In the rabbit amongst lagomorphic rodents and the chiroptera the ovum appears to attain its sub-epithelial position purely by a process of burrowing, and from the appearances of the early human ovum described by Peters there was good reason to believe that burrowing had also occurred here.

In tubal gestation evidence as to the method by which the ovum first gets sequestered in the tube wall is not so clear, because sufficiently early specimens are wanting; nevertheless in our specimens we think that the depth at which the gestation sac lies from the lumen of the tube, together with the fibrinous track indicating apparently the path of the ovum, strongly suggest that borrowing has taken place.

Of course the inter-plical crypts would offer very favourable conditions for primary imbedding, in the same manner as obtains in the hedgehog, and the possibility of this cannot be denied; but even allowing it to have occurred, an assumption of the burrowing process is still necessary to account for the deeply intramural site of the gestation sac.

In our early specimens the bulk of the gestation sac lay in the mesosalpingeal half of the tube, and the fibrinous plug marking the track taken by the ovum also ran in this direction.

It is probable that the ovum travels towards that part of the tube where the nutrition (vascular supply) is most copious, and that in the majority of cases it is primarily implanted in the attached half of the tube wall.

Trophoblast Cells and Decidua Cells.

The cells of the trophoblast are very characteristic objects, being of large size, irregularly polyhedral in form, with ob-ovate, or round, darkly-staining nuclei. The cytoplasm also stains well. In the past there has been much confusion of these cells with *decidua cells.*

If one studies the characters of decidua cells, as seen in sections taken from the endometrium of the uterus in a case of tubal pregnancy, it is difficult to understand how confusion between these cells and those of the *Trophoblast* has come about. Decidua cells are considerably smaller, and are much more rounded in shape. Their nuclei are most markedly "vesicular" in appearance, and exhibit a fine, poorly-staining chromatin network. The cytoplasm

stains poorly also, and between the individual cell bodies is a fine network which may receive processes from them.

If sections of placenta still attached to the uterine wall be made with a view to studying *decidua cells*, it is seen that the cells graced by this name form a dense lamina interposed between the uterine muscle on the one hand and the chorionic villi on the other, and in sections such as these that we have made with a view to distinguishing between trophoblast and decidua cells we find that this cell mass is attached to the uterine muscle by the medium of a scanty tissue of a loose fibroid character. The cells forming it present characteristics exactly resembling the cells of the trophoblast previously described, and bear no resemblance to the decidual cells found in the uterus of tubal gestation.

But there are other features strongly suggesting that this mass of cells is fœtal and not maternal. It contains many layers of laminated fibrin, particularly on the aspect which bounds the intervillous space, and a reticulum of fibrinoid appearance lies between the individual cells, whilst direct continuity can be seen to occur between these cells and the epithelial cells which cover those villi which are attached to the cell mass (*Haftzotten or Fastening villi*).

In short, the appearances of this mass of cells described by the older writers as the decidua serotina make it almost certain that it is identical with the cell-sheet bounding the early gestation sac. This has been emphasised by Kühne, and we entirely corroborate him.

It is then no wonder that confusion should occur so long as these cells be termed "decidual cells" and their characteristics be made the criterion of decidual cells elsewhere.*

The Method of Fœtal Cell Invasion and the Structure of the Cell Sheet.

As has been pointed out, the gestation sac (implantation space) is everywhere bounded by a layer of tissue composed of trophoblast cells and masses of fibrin.

The cells of the trophoblast present two main forms, the large mononuclear epithelioid cell and the multinuclear masses of protoplasm called syncytia.

* Another very interesting point arises in this connection. In early abortion, either intra-uterine or tubal (cf. our sections), the entire cell-sheet remains in the maternal tissues after the expulsion of the embryo, membranes and villi, whereas the cell-sheet comes away with the rest of the fœtal structures when the fully-formed placenta is expelled. Possibly it is owing to this fact that persistent hæmorrhage is commoner after abortion than after labour, quite apart from retention of gross products.

Of these the first is evidently the primitive one, for in addition to being much the most numerous it is the only one which can be said to invade the maternal tissue.*

Sections taken from the periphery of the area of fœtal cell invasion show the mononuclear cells alone, syncytial masses only appearing after a definite cavity has begun to be formed; and the same may be said of the villi.

The method of invasion of these trophoblast cells has already been touched upon. They appear to be insinuating themselves between the muscle tissue of the tube wall in several strata, but always tending to a more or less concentric arrangement, whilst the layers of maternal tissue in contact with them appear to be undergoing a fibrinous degeneration. This fibrin, which is called after Nitabuch, who first drew attention to it, is further formed by a fibrinous material derived from the blood circulating in the gestation sac (intervillous space).

Since the trophoblast delaminates the muscular wall along many concentric planes, it follows that considerable areas of muscle tissue become segregated off between the layers of fœtal cells and subsequently undergo fibrinous change. Thus is brought about the fact that the gestation sac is bounded by several layers of fibrin with fœtal cells in between them, and this appearance is added to by the deposition of fibrin containing many polynuclear leucocytes from the maternal blood.

This admixture of fibrin and fœtal cells is known as the "cell-sheet" (see Fig. 10), and in our specimens it is best marked in that of 24 days' growth. Here it is very deep, and the amount of fibrin contained within it is large. In our younger specimens it is not so well marked, and there is less fibrin.

Fibrin formation appears to reach a maximum in the first few weeks. Later, when villi form, it remains merely as a relic of the effects of the trophoblast cells, nutrition by destruction having given place to nutrition by transudatory exchange.

Stroganowa stated that Nitabuch's fibrin was poorly formed in tubal gestation, but in our specimens it is found in large quantity. The same writer suggested that its presence in considerable quantity was a bar to the further invasion of maternal by fœtal tissue, and that the alleged absence of it in tubal gestation was the cause of the deep penetration and subsequent rupture of the tube wall. That this

* These observations are in accord with the work of Hitschmann and Lindenthal, quoted by Russell Andrews.

is not so is at once obvious, remembering that the cells of the "cell-sheet" are already in large part outside the fibrin layer.

Moreover, although the fibrinous deposit from the maternal blood may tend to strengthen the wall of the gestation sac, like the fibrin layers of an aneurysm, yet the part derived from the muscle tissue of the tube wall is an evidence of the destructive action of the fœtal cells that, persisted in, must lead to rupture.

In all our three early specimens the splitting of the circular from the longitudinal muscle coat is very striking. No doubt this plane of potential cleavage presents a path of least resistance to the trophoblast cells. We shall show presently that it also may form a path of blood extravasation in that form of rupture of the gestation sac that we have termed "intra-mural."

The Origin of the Syncytia.

These multinuclear masses of protoplasm are always found on a free surface. Such free surfaces are in contact with maternal blood, either in the intervillous space or in the lumen of maternal vessels whose walls are being "embryonised" by the invading trophoblast. Thus syncytia may be said to depend upon blood contact for their production.

In some of the lower animals certain observers have described syncytia formation from maternal tissue (Selenka, etc.). We have failed to find any appearances indicating this, it being formed everywhere by a transformation of the mononuclear trophoblast cells (including Langhan's cells), between which and the fully-formed syncytia all gradations can often be traced.

The "Embryonisation" of the Walls of the Maternal Vessels.

Our sections show very clearly the appearances figured in Russell Andrews' paper, viz., trophoblast cells replacing the tissues forming the walls of the maternal vessels (see Fig. 10). Nowhere does the fœtal tissue grow along the lumen of the vessels in the manner described by some workers on placenta formation. It either directly invades the wall from without, so that the mass of trophoblast replacing the vessel wall is directly continuous with a similar mass lying outside the vessel, or vessels may be seen whose walls have been in part replaced by a cell mass not in continuity with any other part of the trophoblast. It is probable in these cases that the trophic ectoderm has found its way along perivascular lymphatics.

It is easy to see how readily the appearances presented by this

"embryonisation" of the maternal vessel walls could be mistaken for an endothelial proliferation (trophospongia of Hubrecht).

Rupture of the Primary Gestation Sac.

We have purposely used the expression "rupture of the primary gestation sac" in preference to "rupture of the tube," because it has a much wider scope than the older term, including, as we shall presently show, three distinct conditions, whilst by the word "primary" we exclude rupture of secondary gestation sacs situated in the peritoneal cavity or broad ligament.

The Causes of Rupture.

Rupture is brought about, excluding accidental mechanical causes, mainly in two ways. Of these the first is the destructive action of the trophoblast, which by the fibrinisation and absorption of the tube wall must of itself eventually lead to perforation.

The other factor is hæmorrhage into the gestation sac from opened-up maternal vessels, which by causing a sudden rise in tension ruptures the sac wall already weakened by the destructive action of the trophoblast. This hæmorrhage is either into the intervillous space (which already contains blood) or into the space between the amnion and chorion, or into both spaces at once.

The second factor is by far the most common determining cause, as the study of any series of tubal gestations will show.

In our series only the three earliest failed to present unequivocal evidence of bleeding into the sac, whilst in these also there had most probably been some hæmorrhage into it. They were all specimens of uncomplicated intraperitoneal rupture of the sac, and in such cases evidence of pre-ruptural bleeding into the sac is almost impossible to obtain, because the blood escapes from the sac when rupture occurs.

The Directions of Rupture.

Our specimens teach us that there are *three* directions in which the primary gestation sac may rupture.

These three varieties of rupture are:—

1. Extra-tubal rupture.
2. Intra-tubal rupture.
3. Intra-mural rupture.

They may be combined in several ways.

Extra-Tubal Rupture *(Ruptured Tubal Gestation)*.

This includes all cases in which the gestation sac ruptures *outside* the tube (see **Fig. 11**).

There are two sub-varieties. They are:—

(*a*) Intra-peritoneal rupture.
(*b*) Intra-ligamentous rupture.

Primary extra-tubal rupture is so well known as to need but a few words. It occurs most frequently in the isthmic segment of the tube for two reasons. Firstly, that on account of the small size of the tube the trophoblast soon reaches the periphery; and secondly, because the lumen being relatively very small compared with the thickness of the wall, the gestation sac does not tend to bulge into it as is the case in the ampullary segment, and therefore intra-tubal rupture is uncommon here.

This variety of rupture is the one most likely to be brought about by the destructive action of the trophoblast alone.

We have suggested that the circular muscle coat offers a much greater resistance to the invasion of the trophoblast than the longitudinal coat, probably by reason of its greater density. In the isthmic segment of the tube this coat is relatively very thick. The growth of the trophoblast is therefore chiefly outwards, and it soon reaches the periphery of the tube.

Intra-Tubal Rupture *(Tubal Abortion)*.

When the gestation sac ruptures into the lumen of the tube the condition is called *tubal abortion* (see Figs. 12 and 13).

This variety of primary rupture is much commoner in the ampullary segment of the tube, because the lumen being large here, the circular muscle coat thin, and the whole tube elastic and distensible, the gestation sac bulges into the canal.

Hæmorrhage into the gestation sac appears to be the common determining cause of this variety of rupture, and the escaping blood either passes out of the tube into the peritoneum (hæmoperitoneum, hæmatocele, see Fig. 12), or is retained within the lumen of the tube (hæmatosalpinx, see Fig. 13).

The gestation may either remain in the sac or may be extruded along the lumen of the tube into the peritoneum, probably by blood pressure behind it, but possibly by active tubal contraction as well.

Intra-mural Rupture.

This form of rupture of the gestation sac has not, so far as we know, been previously described.

It may be compared with the condition that obtains when a saccular aneurysm becomes diffuse.

The gestation sac ruptures into the substance of the tube wall, and an extensive blood extravasation at once occurs, which forces its way amongst the muscle fibres until a large space is formed (see Fig. 14).

It will be remembered that the sections obtained from our early cases demonstrate very clearly the way in which the longitudinal muscle coat is split off from the circular muscle coat. Between these two coats there normally exists a potential plane of cleavage, and several of our specimens of later tubal gestation show equally clearly that in intra-mural rupture the blood extravasates along this plane of cleavage until it forms a mass which appears externally as a sausage-shape enlargement of the tube.

These cases are almost invariably *mistaken for hæmatosalpinges*, the general outline and shape of which they resemble. A proper examination reveals the fact that the blood extravasation is separated from the lumen of the tube by a layer of muscle tissue more or less well marked.

In blood sacs of this nature clotting of the more peripheral portion of the blood is of common occurrence, so that the sac wall is somewhat similar to that of an aneurysm.

Ruptures of this blood sac frequently occur, and the contents then escape either into the peritoneal cavity, broad ligament, or lumen of the tube. The first of these is very common (see Fig. 15), and may occur at several spots, for the thin layer of muscle tissue and peritoneum, which separates the blood sac from the peritoneal cavity, soon perishes, and in many specimens the rough laminated deposit of fibrin, which is often found bounding the more fluid portion of the blood, alone intervenes between the latter and the peritoneal cavity.

Not infrequently these perforations are temporarily closed by fresh blood clots, a fact noted, though in a somewhat different light, by Stroganowa.

Rupture of the blood sac into the broad ligament, though much less common, probably occurs through none of our present specimens show it.

Rupture of the blood sac into the tubal lumen (see Fig. 16) is very common, the blood breaking through the circular muscle, and passing into the peritoneum *viâ* the abdominal ostium, or accumulating to form a true blood distension of the tube (hæmatosalpinx).

Intra-mural rupture is much commoner in ampullary than in isthmic gestation, and it should be noted that the blood usually

extravasates away from the uterus because of the looser structure of the wall of the ampullary segment.

In intra-mural rupture the ovum is not usually disturbed from its bed, and is to be looked for at the uterine end of the tubal enlargement.

It appears to us that some of the cases described as *Para-tubal Hæmatocele* by Sampson Handley* are possibly old examples of intra-mural rupture of a tubal gestation sac, and we were interested to note, whilst perusing this author's monograph, that Cullingworth described some years ago what was probably an example of intra-mural rupture, as an intra-mural hæmorrhage due to a ruptured vein in the wall of the tube.

Combined Varieties of Rupture of the Gestation Sac.

Combinations of the foregoing varieties of primary rupture of the gestation sac are very frequently met with.

This is explained by remembering that rupture is largely due to the tension in the gestation sac, and that if the occurrence of one variety of rupture fails to relieve the tension the gestation sac will probably rupture in some other direction. Thus in intra-tubal rupture (tubal abortion) the blood poured into the lumen of the tube is frequently prevented from escaping by closure of the abdominal ostium by impacted clot or inflammatory adhesion. The tension in the gestation sac not being relieved, extra-tubal rupture usually of the intra-peritoneal type may occur.

Some of the possible combinations of rupture are illustrated in Figs. 18 to 22.

A Note on the Ætiology of Tubal Gestation.

This subject has recently been exhaustively reviewed by Russell Andrews. In so far as our specimens present any additional evidence bearing on the various theories which have been advanced, we may say that signs of pre-existing salpingitis are absolutely wanting in our early cases, which alone are of value in this connection.

Neither was there any suggestion of abnormalities, such as kinks, diverticula, etc., affecting the tubes which, both macroscopically and microscopically, were normal except at the site of the gestation. This was stated long ago by Bland-Sutton.

As regards evidence of "external wandering" of the ovum we would like to place on record that, in our three pregnant tubes of less than a month's duration, the corpus luteum was found in the *ovary*

* *Journ. Obstet. and Gynæcol. of the British Empire*, Vol. i., p. 209.

of the opposite side in two cases, and in the *ovary of the same side* in one case.

In conclusion, we would add that we have abstained from appending a complete list of references to the works of the authors quoted because such are to be found in the monographs of Russell Andrews, Teacher, and Arthur Robinson,* to all of whom we are indebted for material that is incorporated in this paper. Finally, we would express our thanks to Mr. A. G. R. Foulerton for the facilities he has afforded us during the prosecution of this research, and to Miss Appleyard for her valuable aid in the preparation of the drawings.

* Hunterian Lectures, Royal College of Surgeons, England, 1903.

Lutein Cysts in Association with Vesicular Mole and Chorio-Epithelioma ;

A CONTRIBUTION TO THE STUDY OF THE NORMAL AND ABNORMAL PROCESSES SEEN IN THE DEVELOPMENT AND RETROGRESSION OF THE CORPUS LUTEUM.

By Cuthbert Lockyer, M.D., F.R.C.S.

(Continued from page 16.)

In the January number of this Journal I dealt with the results of my own investigations, I will now proceed to consider the work of others upon the subject of lutein cysts and the corpus luteum. Rokitansky was the first to work at the abnormalities of the corpus luteum, and his results were published in 1859, after which we hear nothing of the subject for about twenty years, when Slavianski wrote upon the normal and pathological history of the human Graäfian follicle, both these observers recording cases of calcification of the yellow body. Up to the year 1900, the most important of all the accessible papers are those by Orthmann in 1897, L. Fraenkel in 1898, E. Fraenkel in 1899, and Grouzdew in 1900. Then came the works of W. Stoëckel in 1902, whilst valuable communications were published last year (1903) by Jaffé, Pick, and Runge. The recent literature centres around the fact that large polycystic tumours of lutein-origin have been found in frequent association with vesicular mole or chorio-epithelioma; and whilst dealing with the question of the significance of this association, some of the authors have speculated as to the origin of lutein cysts. In this matter most observers have come to conclusions similar to my own; but I have not been able to satisfy myself that lutein cysts arise from lymphangiectases within corpora albicantia.* The softening and giving way in the centre of a corpus albicans when it occurs, is an early change—too early for any lymphatic vessels to be present in the decolourised clot. If this change can occur in a true corpus luteum, I have never seen it, but upon this point I am sceptical, because a true corpus fibrosum has generally lost all, or nearly all, the lutein layer belonging to the corpus luteum of which it is the relic, and if a cyst did form in this body, whether from distended lymphatics or from softening, the

* I have, however, found abundant evidence of lymphangiectases in the displaced lutein tissue on the periphery of the ovaries in the Brighton case, described in the text, and have shown the same in Fig. 26.—C. L.

structure would not be that of a lutein cyst, as there would be no lutein-cells to surround its cavity. In my opinion, the dense cicatricial tissue has no vessels of its own, and hence lymphatic distension of such tissue is an impossibility. Another point of discrepancy between my views and those of others is as to the origin of the epithelium which lines certain cysts. Pick says it is an ingrowth (in the case of ciliated epithelial cysts, at all events) from the germinal epithelium into the site of rupture of a corpus luteum; such a statement must be supported by ocular demonstration to carry weight. My own view is that the epithelial lutein-cysts are the earliest of all lutein-cysts to form, and that they arise exclusively from developing Graäfian follicles. Whilst I have only observed spherical, transitional, and cubical epithelium in these cysts, others have detected squamous epithelium. Within the last few days I have met with a small cyst, part of whose wall is lined by dermoid structures and part by lutein tissue; the former consisted of epidermis and the structures of the cutis vera. The contained substance was typical dermoid grease. This case I am investigating further. Runge has found ciliated epithelium in many corpus luteum cysts; this is a phenomenon with which I am not familiar. Schaller, Pforringer, and Runge regard the diffusion of lutein-cells throughout the stroma as due to the activity of the cells themselves. Pick and Stoëckel regard it as a passive displacement of these cells. Orthmann states that hæmatomata of the corpus luteum may attain the size of a fœtal head. My largest specimen, which accompanied a large fibroid of the uterus, is of the size of an orange. Whilst Orthmann has found cylindrical, cubical, and squamous epithelium even in a hæmatoma of the above dimensions, I have only met with strands of columnar epithelium mixed with the blood-clot lying free in it.

With regard to the part played by cysts and hæmatomata of lutein origin in oöphoritis, Orthmann found that in thirty ovarian abscesses obtained in Martin's clinic, twenty-one were associated with the corpus luteum. v. Rosthorn and Langer say that most abscesses in the ovary occur through infection of a corpus luteum during its early development. Rheinstein, Gottschalk, Meyer, Orthmann, and Fraenkel all lay stress upon the infection occurring through the point of rupture and the invariable association of salpingitis is regarded as favouring this view. No mention is made of this mode of infection of the ovary by writers such as Bumm and Werthein, who have closely investigated the subject of ascending gonorrhœa. Orthmann's naked-eye description of a lutein abscess and his drawing both agree

with those two cases which I have studied. He says: "The special feature of the large abscesses is the presence of papilliferous excrescences or granular points which cover the entire inner surface, reminding one of "frog-spawn." Orthmann says these warty prominences are granulation-tissue, but I have found lutein cells forming papillary tufts in one of the abscess-cavities which I examined. In my own case the wall was very degenerate and hyaline, and the lutein cells did not enter into the formation of tufts (see Fig. 23). In Orthmann's case, as in my own, the tissues deep to the lutein-layer were very hyaline.

Slaviansky and Nagel noted a white membrane on the wavy internal layer; this consisted of fibrin, and with it was found serous fluid in the cavity of the cyst. This membranous layer was especially well-marked in Dr. Oldfield's specimens. I stripped large flakes of it off and mounted them separately on cork, thinking at first it was the lutein lamina.

Orthmann believes that epithelial cysts can arise after rupture of a ripe corpus luteum. He says: "It is known that after expulsion of the ovum the epithelium of the follicle does not always disappear." My own experience makes me strongly opposed to this view, for reasons more than once stated in this paper. Orthmann states that lutein-cysts are never multilocular, and I am disposed to agree with him in the main, holding, as I do, that polycystic tumours of lutein origin are composed of a congeries of independent cysts, but in the initial stages of their development I have met with one instance of a lutein cyst being bilocular from the start (see "normal" ovary, Brighton case, Fig. 10).

With regard to solid new growths of the corpus luteum, Rokitansky has described two forms—a benign fibroma and a carcinomatous growth. Klob described an ovarian fibroma the size of a fœtal head as arising from a corpus luteum. Voigt also described a malignant ovarian tumour, the size of a man's head, as taking its origin in a corpus luteum. Grouzdew, writing last year (1903), in recording a proliferating lutein growth arising in the left ovary of a woman aged 60, says he has only found two similar cases besides Rokitansky's solid lutein growth (which was only described macroscopically). One is that recorded by Voigt, just mentioned; here Voigt performed Porro-Cæsarean section for pregnancy complicated by malignant ovarian tumour in a woman aged 30 years. The tumour was the size of a man's head and of soft consistence, with a capsule 1—3cm. thick, and a central core which was easily distinguished from the capsular tissue, the latter being rich in blood,

whilst the core was greyish-yellow and homogeneous. Under the microscope the core was found to be a large corpus luteum, and the capsule ovarian tissue. The conclusion was that this represented a growth arising in the corpus luteum of the last pregnancy. The second case Grouzdew mentions is that of Schaller and Pforringer. The patient, a multipara, was aged thirty-two years. There was a vesicular mole accompanied by multiple "new growths" of spurious lutein cysts of one ovary. "These cysts differed from the usual retention-cysts of corpora lutea, in showing carcinomatous degeneration, *i.e.*, the lutein cells showed a tendency to energetic proliferation, spreading into the ovarian stroma and forming nodes, the latter being partly solid and partly undergoing cystic degeneration." The total result was the transformation of the ovary into a nodular cystic growth (11 by 9 by 4½cm. in size) like a bunch of grapes. The cysts were peripheral, being arranged around a central core. This last case has already been discussed under the heading of lutein displacement. From the above description it is clearly an example of polycystic lutein tumour, such as I am describing in the four examples given in the appendix. It has no claim to be regarded either among solid or malignant lutein growths. Voigt's case seems to be the inclusion of a corpus luteum by a rapidly-growing fibroma, as far as one can judge from the description. Grouzdew's case is particularly interesting, owing to the patient being 60 years of age. The author's description of the left ovary is as follows: "There are three peripheral cystic lobes around a central core. One lobe was a cyst with serous contents measuring 4 by 3·5cm. Externally it was smooth in its greatest extent, but not entirely. At one spot on the surface of the cyst was a node 1cm. in diameter. The thickness of the wall varied between 1 and 1½ millimeters. It contained a white external, a dark brown, nearly black, middle, and a yellow internal layer. The inner wall was slightly uneven, but where the wall approximated to the central core of ovarian stroma it was warty. The second cystic lobe had a diameter of 2cm.; it was thinner, and its contents consisted of granular detritus of yellow colour (*cf.* Williamson's case). The third cystic lobe measured 3cm., with a wall 0·2mm. thick, and thick opalescent contents. The central core measured 4 by 3 by 3½cm. Its periphery consisted partly of solid lumps, partly of cysts. On section, the thick tissue was white in colour, but contained dark yellow and dark brown laminæ surrounded by a white capsule. The cyts had various macroscopical appearances; many were thin, transparent bladders, others had thicker dark brown walls and yellow-coloured malt-like contents In the core there were

many small cavities, and in the largest of these a papillary growth. Grouzdew next describes the three large cysts, figuring them A, B, and C. In cyst A there were three layers, (1) peritoneum; (2) a bundle of connective tissue and cells, but no vessels; (3) a layer rich in vessels. On (3) lay broken strands of large irregular cells, packed by connective tissue into bundles and studded with dark yellow pigment. This was the lutein cell layer. The nearer the cells lay to the cyst-cavity, the larger they became; they were here more polygonal and less coloured by stains. There was no trace of epithelium or endothelium, and similarly no basement-membrane. The elements of the inner layer extended into the cavity of the cyst, where they became uneven, but not definitely wavy, as is seen in corpora lutea. Cyst B was much richer in lutein cells than A, and they extended through the inner and the whole length of the middle layers, so that only the thin outer layer was free from them. Cyst C was a proliferating glandular cystoma. The central core contained corpora albicantia (as proved microscopically); and within these bodies yellow cells were found. The arrangement of these cells in reference to the scar-tissue of the fibrous body varied. In many cases lutein cells lay at the periphery of the fibrous tissue, where they formed either a thin layer or conglomerate masses. Within a corpus albicans they occurred singly or in collections; the latter in some cases filled the corpus albicans. The number of cells massed together determined their shape; where they were single they were polygonal and clearly outlined; their nuclei clearly showed karyokinetic division. In the denser parts the cells were less distinctly outlined and were rounder in shape, and the pigment appeared horny and dark. Mitosis was here absent. The centre of a mass of cells showed the latter undergoing degeneration, whilst peripherally-growing connective tissue and vessels entered it. The cystic part of the central core consisted of tiny cysts lined by lutein cells; these lay immediately inside a connective-tissue layer. The cells were dark-coloured, had a rounded form, and were smaller in size, and between them ran great vessels. Then came clear cells, larger and polygonal, between which capillaries ran; still further in lay cells in various stages of degeneration; these gave way to the cyst-cavity which was filled with detrius. The other cystic formations owed their origin to degeneration of the follicle. Their walls consisted of more sclerotic tissue; they were lined by epithelium and contained a layer of lutein cells; but it was to be noted that nowhere in the ovary was a follicle present, either primordial or ripe. The patient had a "fibrous" tumour of the uterus, which the author seems not to have

examined microscopically;* and she died of ascites, omental and peritoneal growths, which he says turned out to be spindle-celled sarcomata.

Without investigating the nature of the uterine growth (which may have been a sarcoma), he concludes that the omental and peritoneal growths were secondary to the ovarian tumour above described!! Bland-Sutton quotes Patenko as stating that corpora fibrosa may attain the size of a hen's egg (*Virchow's Archiv*, Vol. xxxiv., p. 193). Bland-Sutton adds, "sometimes these fibrous bodies are pedunculated." I myself removed an ovary to which was suspended a pedunculated hard body which under the microscope was found to be a dense fibroma, and I have found sessile fibromata projecting partly in the stroma and partly beyond the surface of the ovary, but in neither case was there any evidence of a lutein origin. My sections, showing a skin lining along one segment of a cyst ending abruptly and being succeeded by a lutein lining, do not prove that a lutein cyst may give rise to a solid neoplasm, but merely show that two pathological processes may exist in a follicle at one and the same time. Grouzdew mentions that "complication cysts" can arise by the fusion of a lutein cyst with another follicular cyst with an epithelial lining; and he figures an egg-shaped cyst, showing the epithelium of the former growing along the wall of the latter, and the lutein cells of the latter invading the cavity of the former, thus making two cysts genetically distinct, simulate each other in character. Perhaps something of this kind has happened in the case of my specimen. I have never met with a solid growth which could be proved to arise from the lutein cells.

With regard to the origin of the lutein cell, Pick, Bischoff and Stoëckel agree in thinking that it arises from connective-tissue—from the elements, in fact, of the theca interna. Pick says that neither lutein cell displacement nor degeneratio polycystica luteinalis is characteristic of the ovaries found in association with vesicular mole, but that where the latter exists the former does also. It may be, he says, that in their most pronounced development these conditions only occur with vesicular mole; the conclusive answer awaits the collection of further material. My own contribution to the settlement of this point is the record of the four cases of double degeneratio polycystica luteinalis now under consideration; one was associated with vesicular mole, and three with vesicular mole plus chorio-epithelioma. Of the ovaries which appeared normal in association

* Excepting that some scrapings obtained by curettage a year or more previously were diagnosed as "degenerating fibroid."

with chorio-epithelioma, one pair (Brighton case, published in *Practitioner*, December, 1904) were studded with islands of lutein-tissue and contained numerous small lutein-cysts and lutein-hæmatomata. In another pair of ovaries I found excess of lutein tissue marked in both; whilst in the third (Dr. Smallwood Savage's case) I only saw a single section of a small segment of the one ovary, which he removed, and this contained no lutein-cells at all. My experience is therefore in accord with that of Pick, J. Neumann, Schaller, Pforringer, Poten, Vassmer and Stoëckel, with reference to the excess of lutein tissue in association with vesicular mole. With regard to the frequency of polycystic lutein-tumours in cases of chorio-epithelioma, Runge, of Dresden, has reviewed the histories of 144 cases of chorio-epithelioma following vesicular mole. In 81 no account of the state of the ovaries is recorded; of the remaining 63, 11 had no naked-eye abnormalities; in 28 there was nothing pathological to be found beyond small cystic degeneration; but in the remaining *24 there was more or less extensive cystic disease.* In another series of 28 cases which concerned only vesicular moles—not chorio-epithelioma—Runge found 16 ovaries described as "normal;" in *12 there was cystic degeneration.* No note is made of the precise kind of cystic disease in any of these cases, and it is regrettable that in so many the condition of the ovary was entirely overlooked. The question arises, do large polycystic lutein-tumours arise apart from the association of vesicular mole? If Grouzdew's case be regarded as of this type, they certainly can; but with this exception, I have not found any case on record where such tumours as I am describing here have been met with independently of vesicular disease of the chorion. This may well be due to their nature being overlooked; for, although they present very definite naked-eye features, it is easy to understand that where a routine pathological examination is not made, many of these cysts escape notice. Even when a microscopic section is made, it may, if taken from one of the largest cysts, show nothing but an unrecognisable flattened lamina in the place of lutein cells.

The same question arises in respect to the excess of displaced lutein-tissue. Is this a characteristic accompaniment of vesicular mole and chorio-epithelioma? Pick says it is to be found in all polycystic degenerated ovaries which are associated with vesicular mole, whilst in Jaffé's left ovary it was not found. Through the courtesy of Dr. Teacher I cut and examined sections of both normal-looking ovaries in Dr. Kelly's case of chorio-epithelioma. In one there was a lutein cyst, but no lutein-displacement; in the other

there were both lutein cyts and lutein cells in the stroma. The fact, however, remains that the time is not yet ripe to settle these questions. In my limited experience I have found more lutein tissue present in cases of vesicular mole and chorio-epithelioma—either in the shape of lutein cysts or displaced lutein tissue, or both,—than in any other associated condition. Enough literature has been already published upon the etiology of vesicular mole to point to pathological conditions of the ovaries as being in some way bound up with the fate—the early fate, at all events,—of the ovum. Marchand was the first to express the view that ovarian disease may influence the development of the ovum. He says: "The influence of the maternal organism makes itself felt upon the ovum in the ovary, the latter transmitting any peculiarities it may possess to the developing ovum. These tendencies show themselves during the development of the ovum in the utero." Next came the light which Marchand, L. Fraenkel, Apfelstedt, Aschoff, Neumann, and others threw on the real nature of the histological features of a vesicular mole and chorio-epithelioma; this changed the views of most Continental observers who had originally held the myxomatous theory for the mole and the sarcoma theory for chorio-epithelioma. The work of Peters and Heukelon on young ova convinced Marchand that whatever might be the nature of the two layers forming the investment of a chorionic villus, the origin of chorio-epithelioma from both of them was no longer a matter of speculation. The epithelial origin of these two layers is now accepted by all observers. Most authorities, with the exception of Langhans, Sfameni, and perhaps a few others, regard the epithelium as fœtal and not maternal. In the fœtal activity of the trophoblast is seen the physiological prototype of the proliferation of the two limiting layers of the chorionic villi as demonstrated in vesicular mole, and especially in malignant moles and chorio-epithelioma. Now came the question: what causes the excessive proliferation of the trophoblast of the ovum, such as we see demonstrated in vesicular mole? And from the striking association of the ovular disease with the special ovarian changes which are mentioned throughout this paper was evolved the theory that when the ovaries contain an excess of lutein-tissue, this, by its internal secretion, sets up a reaction in the trophoblast of the embedded ovum, and to this Pick has given the name "chorio-epithelomatous reaction," since its result is a mole or chorio-epithelioma. In other words, the changes in a growing fertilised ovum, which convert it into a mole or a chorio-epithelioma, are referred to the effects produced by an internal ovarian secretion, and this internal ovarian secretion, derived from the lutein-cells, is

thought by Pick to be in excess. With regard to what is known about this internal lutein-secretion, L. Fraenkel has come to the following conclusions from observations made upon animals and operation cases:—

1. The corpus luteum is a gland with an internal secretion capable of being always formed afresh in the (functional) ovary.

2. The corpus luteum carries cyclic nutritive impulses to the uterus, especially affecting the endometrium, in the connective-tissues of which it excites extreme hyperæmia and hyperplasia.

3. It effects the adhesion of the impregnated ovum or, when failing to do so, it excites menstrual secretion. In bitches L. Fraenkel has watched the embedding of an impregnated ovum seven days after coitus, and finds that excision of the ovary or destruction of the corpus luteum in such a case prevents the embedding of the ovum, even when the remainder of the ovary is intact. Again, in nine cases of ventro-fixation of the uterus in which the adnexa were healthy, Fraenkel has prevented in eight cases the next menstrual epoch by igni-puncture of a fresh corpus luteum, and he says that this has an important practical bearing upon ovariotomy performed during pregnancy, which should be deferred until the seventh or eighth week when the function of the corpus luteum has been completed. (See Elis Essen Möller's case, p. 107.) The corpus luteum of the cow has been utilised as a therapeutic agent, the parenchyma being dried and supplied in tablet-form under the name of "Lutein Tabletten." In threatened abortion the author has tested the use of the "Lutein Tabletten" in 15 cases. He says the results were trustworthy and prompt, but not absolute nor lasting, since in certain severe cases, fresh signs of abortion occurred; but most probably a human preparation would be entirely successful. The author next refers to Lindenthal's case, in which he ruptured a fresh follicle of a healthy ovary whilst performing ovariotomy for a cyst of the opposite side, and menstruation occurred prematurely. Fraenkel has also confirmed this experiment in a case of his own, where menstruation was not due for a fortnight, but it occurred four days after operation. The author states that his observations prove that the rupture of a corpus luteum occurs a fortnight before the onset of the uterine flow, and the corpus luteum which results determines by its internal secretion the next menstrual epoch. Mandl cites his own experiment to refute this. After he (Mandl) had transplanted an ovary between the muscles and fasciæ of a bitch, coitus was permitted, and some days later the other ovary was removed. Embedding took place, although the bitch had only

one ovary, and that one Mandl found to contain no corpus luteum.

L. Fraenkel next draws attention to the association of vesicular mole and ovarian cysts. He mentions his own case, that of Kreutzmann, and the one published by Malcolm, Bell and Lockyer, in the *Trans. Obstet. Soc.*, London, for December, 1903. In these cases he regards the ovarian tumour as the primary lesion, and the disease of the ovum as secondary to it, and adds that no one can regard the coincidence as accidental. He further states that he believes the primary ovarian lesion to be "an injury" to the corpus luteum resulting in the *diminution* of lutein tissue. Runge, like Pick, on the other hand, attributes the excessive growth of the trophoblast-layers to a *plus* quantity of lutein-cells, and indeed all authorities, except Fraenkel, take the latter view.

To sum up L. Fraenkel's experiments which were carried out during his investigations on the influence of corpora lutea on pregnancy:—

1. In many cases he removed corpora lutea from both ovaries, leaving some undisturbed; the result was that pregnancy continued.

2. Cavities were burnt into the stroma in the *neighbourhood* of corpora lutea; result, pregnancy undisturbed.

3. Histological proof was obtained that in cauterisation of a corpus luteum the surrounding stroma did not suffer injury.

4. Mandl's last experiment was repeated; result, no pregnancy.

Fraenkel has carried the question of the uses of lutein cells into the region of bio-chemistry, and in addition to the specific lutein-substance which he has obtained from the cow, sheep and pig, he has procured an anti-lutein substance from dogs, guinea-pigs and mice. By means of this body it is suggested that sterilisation may be brought about by bio-chemical means. Since Fraenkel attributes the embedding of the ovum to the influence of "lutein," and since we know that histologically it is the penetration of the growing trophoblast which secures that embedding, it is incomprehensible to me why he should think that a *minus* quantity of lutein accounts for over-production of trophoblast, and, thinking this, why he should employ "lutein" in tablet form to prevent abortion, *i.e.*, to prevent cessation of trophoblast development.. He *gives* "*lutein*" to stimulate healthy trophoblastic growth and so prevent abortion, and yet he says he thinks that trophoblastic *over*-growth is due to the *want* of "lutein." He is giving anti-lutein to prevent trophoblastic growth and so secure sterility by preventing embedding, and yet he thinks trophoblastic over-growth is due to a *want* of lutein. He bases this queer conclusion solely upon finding a corpus luteum

"injured" by a lutein-cystoma in a case of vesicular mole; but he seems to have quite overlooked the fact that almost certainly in this case, as in all other cases fully investigated, the cystoma themselves contain a plus quantity of lutein tissue. The Essen-Möller case of double ovariotomy in the beginning of pregnancy, in spite of which the gestation continued to full term, has an important bearing upon Born's theory as worked out by L. Fraenkel. The patient was a 3-para, aged 43 years. After an ovarian cystoma had been diagnosed it was removed on September 6th, 1903. The cyst came from the left ovary, and from it six litres of opaque fluid were drawn off. The right ovary being enlarged, was also taken away. The uterus "seemed somewhat enlarged." The convalescence was uneventful. The right ovary contained a corpus luteum of pregnancy. On June 2nd, 1904, a living child was born. It died six days later of congenital heart disease; its weight was not taken. The patient could not remember the date of the last menstrual period. The child was born 269 days after the operation of removal of both ovaries, including a corpus luteum. Here we have therefore a total ablation of ovarian stroma and lutein-tissue within the first month of gestation (unless the latter continued much longer than normal). The question of an accessory ovary can certainly be excluded, the author tells us, and hence this case does not harmonise with the Born-Fraenkel theory, which assumes that the presence of the corpus luteum is essential to the early well-being and development of a fertilised ovum. Whether this case is an exceptional one or not time alone can prove.

The conclusions of Jaffé on the origin of lutein-cysts and their concurrence with vesicular mole are as follows:—

1. In many cases of vesicular mole there is a peculiar many-bladdered or grape-like growth, generally, but not always, double-sided, of ovarian origin and confined to the ovary. These tumours are large enough to be clinically significant. The nature of the growth is a "degeneratio polycystica e corporibus luteis," *i.e.*, the cystic spaces of the growth are corpus luteum cysts. The single loculi vary in size from microscopic dimensions to the bulk of an apple; sometimes these are combined with the cysts of the Graäfian follicle and with lymphangiectases.

2. The macro- and microscopical peculiarities of these multiple and voluminous lutein cysts depart in many ways from the usual type of corpus-luteum cyst, *e.g.*, they are bladder-like; their inner surface is smooth and devoid of colour; they possess no moveable membrane; they have colourless serous contents; there is stratifica-

tion and flattening of the lutein-layers; the fibrous part of the cyst-wall is undifferentiated.

3. Corpus luteum cysts can arise not only from corpora lutea vera and spuria, but also from unruptured follicles.

4. During the rapid and copious formation of lutein-tissue, a dissemination of lutein cells occurs through the ingrowing of vessels of the theca interna, and this diffusion is especially marked in œdematous ovaries. Often, if not always, a transition of the cells of the theca interna into lutein cells can be made out.

5. Degeneratio polycystica e corporibus luteis with the formation of macroscopic cysts is not specific of vesicular mole; it occurs in the non-gravid subject. The grape-like multilocular lutein-cystomata are hitherto exclusively observed in cases of vesicular mole.

In all thorough investigations of the ovaries taken from cases of vesicular mole, lutein cysts are found, even when they do not give rise to large tumours. The importance of the special ovarian change associated with vesicular mole lies not in the cysts, but in the over-production of lutein-tissue. What is wanted to establish the relationship between over-production of lutein-tissue and vesicular mole is a systematic examination of the ovaries in future cases of this disease.

7. Since the Born and L. Fraenkel hypothesis that the corpus luteum influences the insertion of the gravid ovum is now established by experiment, and further, since the process of insertion is the work of the trophoblast, and since in vesicular mole we have an abnormal proliferation of the latter, so the view is founded that through the over-production of lutein-tissue an abnormal trophoblastic action, and thereby degeneration of the chorion brings about the formation of vesicular mole. Positive discovery has proved that the active chorio-epitheliomatous proliferation in chorio-epithelioma malignum is occasioned, at least in certain cases, by over-production of lutein cells.

8. The hypothesis that a diseased follicle may give rise to a diseased ovum and bring about the formation of a vesicular mole is not yet sufficiently established by facts.

In conclusion, I repeat, with Jaffé, that what is wanted is more facts, more cases, and would plead through the medium of this journal for more systematic and thorough examination of the ovaries wherever possible in cases of vesicular mole and chorio-epithelioma.

APPENDIX.

Mr. Malcolm's case of cystic ovaries with vesicular mole and chorio-epithelioma.

PLATE II. Posterior half of Right Ovary seen from the front.
(Mrs. Scharlieb's case).

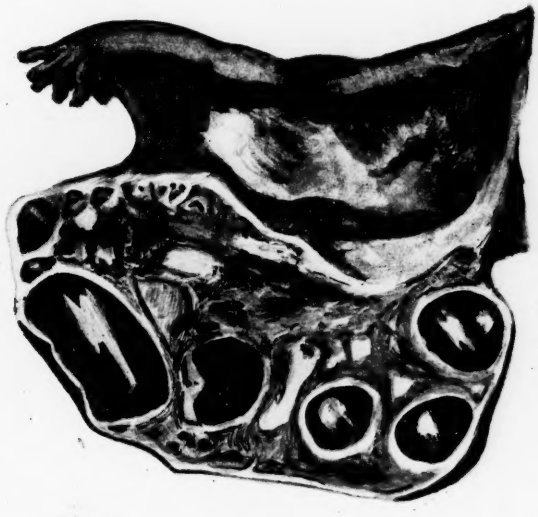

PLATE III. Anterior half of Left Ovary seen from behind.
(Mrs. Scharlieb's case).

PLATE IV. Left Cyst seen from the front. (Dr. Carlton Oldfield's case).

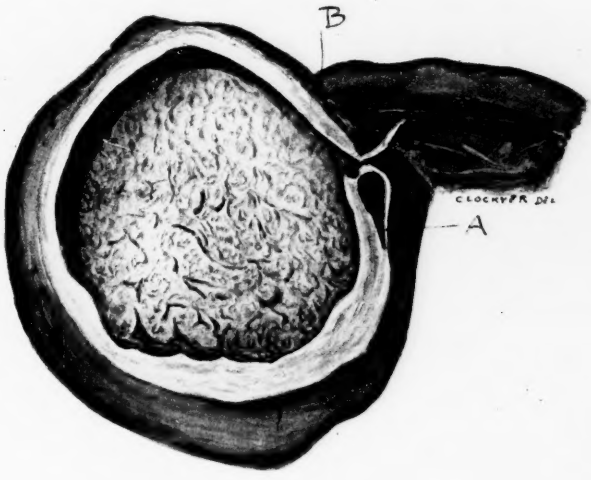

PLATE VI. Lutein Abscess opened up to show the Tuberculated (frog-spawn-like) lining; and (A), Small Hæmatoma in thick abscess wall; (B), Fallopian Tube adherent to the thickened wall of the cyst.

PLATE V. Right Cyst seen from behind. (Dr. Carlton Oldfield's case).

The clinical history of this case and the external appearances of these ovaries have been already described (*vide Trans. Obst. Soc., Lond.*, 1903, Vol. xlv., p. 490). The characters of their internal appearances and minute histology have never before been published, although I described the nature of the cyst-walls and showed a drawing of the lutein-laminæ by which these were lined, after reading my pathological report on these growths at the December Meeting of the Obstetrical Society, 1903. The right cyst is intensely injected, owing to its pedicle having been twisted. It measures 3×4 inches in diameter, and its longest axis is transverse. On mesial section it presents a central core of ovarian tissue, infiltrated with blood, and therefore of a dark maroon colour. Nevertheless, an abundance of yellow tissue (lutein) is distinctly visible. One tiny cyst the size of a cherry-stone stands out most clearly in the centre of the stroma by virtue of a thick plicated pearly-white lining. Another prominent object in this situation is a solid yellow mass, the size and shape of a kidney bean. The rest of the tumour is made up of ten separate loculi, and for the most part these contain a fluid which after hardening coagulates to an opaque yellowish-white jelly, unstained by blood. The lining of all the cysts, however, is deeply blood-stained. The internal lamina is easily peeled off the true cyst-walls. The left cyst measures 3×3 inches; when opened, the ovarian stroma is seen to be reduced to a very small solid area about $\frac{3}{4}$-inch square, situated at the hilum. In it no yellow areas are apparent to the naked eye. The loculi number six, as seen on the cut surface; they are very large for so small a tumour. Their walls are extremely thin; the yellow lutein-lamina appears in patches, and can be seen from the outside by transmitted light with great distinctness. (See Fig. 21.)

Dr. Williamson's case. The clinical history is taken from Williamson's paper (see Bibliography). "H. L., aged 23, was admitted into Martha Ward of St. Bartholomew's Hospital on August 26th, 1872, suffering from hæmorrhage and from some tumour occupying the anterior vaginal wall. The patient has been married for five years, and has had three children, the youngest of whom is $2\frac{1}{2}$ years old. She has had one miscarriage—*a vesicular mole—15 months ago.* Since then she has never been well, nearly always losing blood from the vagina. For the last five months she has noticed a swelling in the vagina, which has been gradually growing larger, and causing pain and discomfort; she has also suffered from dysuria; now she can only void an ounce or two of urine at a time. For the last ten days her breathing has been very short, and she has suffered from cough and expectoration." On admission her complexion was sallow and jaundiced, the eyes dull and heavy, the tongue furred but moist. The pulse-rate was 142 beats per minute, the temperature 102·2°, and the respirations 30 per minute. On examination of the chest impaired resonance, amounting to actual dulness in each axilla, was discovered, and numerous râles and crepitations were heard. On palpation the abdomen was tender; in the right iliac fossa a distinct tumour was felt, about the size of a large egg, elastic and very tender to the touch. After admission she lived for nearly six weeks; the temperature remained high, respiration grew more and more difficult, the vaginal discharge became very offensive, and on October 3rd she died with the symptoms of septic infection."

Post-mortem Examination. This was made on October 4th; the notes are headed:—"Hæmatomata vaginæ, ulcerous metritis, pyæmia, cystic ovaries, pulmonary tuberculosis." There is slight jaundice. Old scrofulous scars are present underneath the left ramus of the inferior maxilla. The

peritoneal cavity is full of pus, and the organs matted together by soft lymph. The right pleural cavity contains about one pint of pus, also soft lymph. The peri-cardium is natural. The vaginal wall is full of hæmatomata of all sizes up to a walnut, the blood is some of it quite recent *(sic)*, some decolourised. There are also smaller hæmatomata, obviously contained in blood-vessels, situated chiefly about the ostium vaginæ in the anterior wall. The uterus is three or four times its natural size, its tissues pale and soft. Its anterior surface is covered with black detritus, and deeply ulcerated in places, the whole surface being sloughy. Both ovaries are highly cystic, and the left adherent to the left side of the vagina. There is no perimetric hæmatocele. The stomach and intestines are natural. The liver shows extreme parenchymatous degeneration. The right lung is full of pyæmial nodules, the left contains only a few; both are studded with hard nodules, no doubt tubercular. The spleen is large and soft, it shows many disintegrating pyæmic infarcts."

Present state of the ovaries (1904). The right cystic ovary measures in its shrunken condition 8·5cm. in length and 4cm. in width. On section many of the cysts are filled with a solid yellow substance of granular soft consistency. There are two distinct laminæ composing the cyst-wall; the inner is yellow and easily detachable from the outer fibrous layer. One circular space, measuring 2cm. × 13mm. is filled with blood-clot, and has a yellow lining which is not corrugated, and appears to be a follicle distended with blood. The cyst from the left side measures 10 × 4mm.; it contains five separate loculi, all of which possess a yellow lining. This tumour is much shrunken from prolonged immersion in spirit.

Mrs. Scharlieb's case of hydatid mole and cystic ovaries. See plates II. and III.

The clinical notes are taken from Mrs. Scharlieb's paper (see Bibliography). L. D., single, aged 24, always regular and normal in her menstruation; periods ceased from July until October, 1902. Hæmorrhage from the 9th to the 15th of October, recurring on 23rd, when the patient was admitted into the Royal Free Hospital. On admission the pulse-rate was 120; the temperature varied between 97° and 99°. Loss of blood was profuse; there was abdominal pain. The diagnosis of pregnancy was obvious, but the size of the uterus did not correspond with the dates given. Against the presence of vesicular mole was (1) a uniform and unvarying hardness of the uterus, which was never detected in a doughy or soft condition; (2) the discharge consisting of blood and clots, without any watery or pink discharge, and the absence of vesicles. On November 10th, 32 days after the first hæmorrhage, alternate contractions and relaxations of the uterus were noted, and on this date the mole was expelled, and then a tumour was diagnosed to the right of the uterus, and a pelvic tumour was also felt *per vaginam* to the left of that body. The former was diagnosed as a cystic ovary; the latter was thought to be a diseased tube. By laparotomy it was discovered that both tumours were multilocular cystic ovaries, the left being bound down by adhesions. The uterus was larger than it should have been, and was consequently removed, together with both cysts and tubes. The convalescence was rapid.

Out of the many sections cut from the uterine wall, only one showed traces of the vesicular mole, in the shape of a dropsical villus and some masses of cells resembling in all respects those seen in the sections of the mole. For the microscopical characters of the cyst-walls, see Figs. 1, 14, 15.

The large cyst belongs to the right side. It measures 3 inches in its

vertical, and 4½ inches in its transverse diameter. To it is attached the right Fallopian tube and corresponding meso-salpinx. The tumour appears to consist of a congeries of smooth thin-walled cysts. The outer surface of the latter have a pearl-like lustre, and when held to the light the cysts and their contents are translucent, excepting in the case of a few which have a magenta colour, from admixture of blood with the cystic fluid. On section after hardening, the cut surface shows that the true ovarian stroma occupies only a very small portion of the tumour, and that which is still present occupies a position near the hilum. It measures 1 inch square. One side of it is attached to the meso-saplinx; on the other three sides it is surrounded by cysts. It is very pale, and is composed of strands of œdematous tissue. In its centre is a corpus albicans, surrounded by a ring of yellow tissue; this body measures half an inch in diameter. The rest of the growth is made up of eight loculi, with very thin walls. The latter are lined by a delicate membrane which is easily separable (contrast Jaffé) from the wall itself. The contents of the loculi have been rendered solid by hardening in Kaiserling-Pick's solution. In the larger cysts—which measure 1¼ inches in diameter—the solid mass cuts like homogeneous opaque yellowish-white jelly, while in some of the smaller spaces the cavity is occupied by strands of a delicate œdematous network. In some instances this is stained with blood or actually intermixed with blood-clot. Between adjacent septa thin strands of ovarian stroma are still to be traced, and in it are many tiny islands of yellow tissue, and one small corpus albicans. The right Fallopian tube is quite healthy; there is no sign of adnexal inflammation or twisting of the pedicle.

The left-sided tumour is smaller than its fellow, which in general characteristics it closely resembles. The long axis, which measures 3½ inches, lies transversely; its vertical measurement is 1½ inches. It is roughly kidney-shaped, with its hilum attached to the meso-salpinx. It is accompanied by the left tube and meso-salpinx, neither of which show any sign of inflammation. The tube is turgid, but not more so than the changes due to gestation would account for. It is seen on section that this tumour contains a good deal more ovarian stroma than was found to be present in the right-sided growth. The solid ovarian tissue is very œdematous; it contains a quantity of lutein-tissue; this is seen on naked-eye examination as rounded crenated yellow bodies. Several corpora albicantia are present, and where the stroma is most abundant there exists a space with a yellow lining filled with blood. The rest of the growth is composed of ten loculi, the largest measuring $1 \times \frac{3}{4}$ inch, and the smallest being the size of a pea. Their contents have solidified by hardening and present the smooth albuminated appearance noted above in the cyst of the right side. The loculi have a pale yellow detachable membrane, for the most part smooth, but in places it has a wavy or folded outline. Externally this tumour still presents the old cicatrices due to rupture of Graäfian follicles.

Dr. Carlton Oldfield's case. See plates IV. and V. Full details of this case will be published by Dr. Oldfield himself, but he has kindly given me permission to mention the following clinical facts:—

The patient was single, aged 25, a primipara. The first symptom was excessive hæmorrhage, at least two pints of blood being lost. The os was dilated by the fingers, and ovum forceps were used for the removal of the mole. The uterus was not curetted. Five weeks after this operation Dr. Oldfield removed the uterus and two multilocular ovarian cysts. The

patient married within one month of this second operation, and is now, December, 1904, perfectly well.

Macroscopical report of the tissues removed. The uterus measures 9·5cm. in length, 6cm. in width from cornu to cornu. Its wall, half-way between fundus and cut surface, is 3cm. in thickness, at the cut surface it measures 2·5 cm. across. The posterior wall of the uterus contains a disc-shaped growth,* situated 0·5cm. to the right of the mid-line and embedded half-way between mucosa and peritoneum. The top of the growth is 4·5cm. from the fundus. The lower limit of the growth is 2·5cm. from the cut (amputated) surface. The growth is disc-shaped; from above down it measures 1·5cm.; its transverse measurement is 0·9cm. The depth of the disc is 1cm. Above it lies a venous space filled with growth; this measures 0·5cm. One cm. of muscle-wall lies between growth and peritoneum; the same thickness of muscle-wall lies between growth and mucosa. There was nothing in the mucosa over the growth to suggest its presence in this situation. The uterus was cut methodically into slices before it was discovered. Some sections of the uterus taken from its posterior wall, but to the right of the mid-line and within 1·5cm. of the cut end, show what look like thrombosed vessels. The entire organ was soft and flabby, cutting with extreme ease and with a pallid surface. No other areas suggesting further metastases were found. The mucosa was not thickened; it showed two fatty-looking bodies, the size of pins' heads—degenerate chorionic villi.

The right cyst is 17cm. long in its oblique axis, 11cm. wide transversely, 5cm. in depth. It is composed of seven bladder-like loculi, which look like thin translucent bubbles about to burst. Near the attachment of the ovarian ligament one cyst contains a recent corpus luteum (fresh blood-clot, etc.) in its walls; its contents resemble degenerate œdematous strands soaked in a blood-stained fluid. The tube measures 6cm.; the meso-salpinx shows a thickened organ of Rosemüller, and close to the cyst, near the ovarian fimbria is a pedunculated body representing a fœtal relic of Müller's duct. All the cysts contain a lutein-lamina, and where the walls are thick (between two adjacent loculi), they contain the yellow corrugated remains of corpora lutea. The right tube is normal.

The left cyst is 12cm. long in its oblique axis, 9cm. wide, and 5cm. deep. It is composed of eight loculi of the same tense bulging character as seen in the right cyst. Some loculi—the smaller—contain blood-stained fluid; the majority contain a clear yellowish-green fluid. The left tube is 4cm. long, normal in appearance, and 1cm. from its ostium is seen a accessory tube (a small pedunculated cyst attached to the tube itself). The fluid is yellowish-green, spontaneously coagulable after one hour's standing, highly albuminous, rapidly becoming solid on boiling, neutral to litmus, coagulates at 145°F., specific gravity 1020; not tested for sugar.

A case of lutein abscess and calcareous lutein hæmatoma. See plate I

The patient was 54 years of age. She had been married 22 years, and had had no children, but several early abortions. The menopause occurred six years before admission. On May 1st, 1903, I was asked to see her on account of profuse hæmorrhage, which had been going on for three weeks. There was pain in the left iliac region and down the left side. A pelvic

* This was found upon microscopic examination to be a typical chorio-epithelioma.

swelling was felt, rising up to within two fingers' breadth of the umbilicus. It simulated, in position and on palpation, a distended tense urinary bladder, but the drawing off of urine left the tumour unaltered. It was uniformly dull, felt cystic, and was tender, especially on the left side at the site of the pain. *Per vaginam*, the uterus was retroposed, the fundus deflected to the right, a nodule was felt in the left posterior quarter of the pelvis, close to the cervix uteri. In the anterior fornix a tense, cystic, fixed mass was felt, and this was continuous with the cystic swelling in the hypogastrium. The examination was very painful. The uterus could not be moved in any direction; it was absolutely fixed. Its outline could be traced by following up the supra-vaginal cervix in the right fornix. This revealed the fundus bent over to the right. The possibility of the presence of a left broad-ligament cyst, burrowing under the peritoneum of the utero-vesical pouch, was entertained; the abdomen was opened on May 8th, 1903. The rectum was found to be adherent to a large cyst, occupying the left half of the pelvis, and the bowel was infiltrated by what appeared to be a hard carcinoma. The uterus lay to the right; it was twisted, deformed, hidden by adhesions, and over-lain by the cyst; nothing was removed. The abdomen was closed, and the patient did perfectly well for four days, but on the morning of May 12th she suddenly became unconscious, cyanosed, dyspnœic; then, after a conscious interval, in which she was given some weak brandy, she called out to the nurse that she had a pain in her chest, and again becoming unconscious, she expired. At the *autopsy* (which was not allowed to extend to the chest), the pelvic viscera were found matted around the cyst, to which also the rectum, kinked into an omega loop, was adherent. The tissues were removed entire. The abscess had very thick walls, and was full of flocculent pus; its posterior wall was bound to the rectum by an inflammatory mass of cartilaginous hardness. The uterus was twisted in its long and also in its transverse axis; the fundus was bent to the right. The left Fallopian tube was found after prolonged search to lie in front of the abscess-sac; it was much dilated and flattened out between the peritoneum and the laminæ forming the sac-wall. It was curved upon itself, so that its ostium looked towards the uterus. The left ovary was not seen, the abscess-sac representing it. The right tube was dilated, thickened, and its end was adherent to the right ovary. The latter consisted of a shell of fibrous tissue, containing a hard, stone-like body, the size of a walnut. Along both ureters ran a chain of calcareous glands; the left ureter ran under the cyst, to which it adhered below and behind for a distance of 10 inches. Several pea-like bodies as hard as stones, were dissected out of the connective-tissue between the ureters at the base of the bladder. Some of these were phleboliths, lying in definite vessels; others appeared to be calcareous glands, a few of the latter being as large as marbles. The interior of the uterus contained a soft, polypoid mass, projecting from the right cornu. This, on microscopic examination, showed a sarcomatous structure, and was no doubt the cause of the three weeks' hæmorrhage occurring six years after the menopause.

The abscess-wall shows a degenerate lutein lamina, and also lutein cells, very necrosed, lying free in adherent *débris*. (See Fig. 24.) The calcareous body shelled out from the right ovary is seen in the microscopical drawing (Fig. 25); it is a calcareous, corpus luteum. Sections of the tubes showed marked infiltration of their plicæ and muscular walls; the wall of the right tube is much thickened, that of the left was thinned out by stretching over the front of the lutein-abscess.

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Two Cases in which Enlarged Wandering Spleens simulated Pelvic Neoplasms.

By Frank E. Taylor, M.B., B.S. (Lond.), F.R.C.S. (Eng.),
Pathologist to the Chelsea Hospital for Women, London.

That an enlarged spleen, when forming an abdominal, or even an abdomino-pelvic swelling, may simulate a solid or cystic uterine or ovarian tumour is a well-recognised fact. Indeed, most text-books on gynæcology mention this as one of the conditions to be taken into consideration in arriving at a differential diagnosis of these diseases.

Lieut.-col. Sturmer,[1] of Madras, has described a case of this nature in this Journal for October, 1904. As an indication of the rarety of any real difficulty arising in this connection he states that "up to the present I never had any difficulty in diagnosing an enlargement of the spleen, and I must have seen hundreds of cases—for India is the land of the enlarged spleen." He therefore considers that such cases "seem worthy of record, if only to put others on their guard, and to prevent them from mistaking an enlarged spleen from some growth arising out of the pelvis."

The characteristic features of a splenic enlargement which should differentiate it from pelvic and abdominal neoplasms are, according to Sturmer, as follows:—

1. The growth can be traced to its origin under the ribs.
2. There is usually a well-marked history of fever.
3. Cachexia is generally present.
4. The presence of a "notch" in the border of the tumour.

None of these guides, however, was available in the following cases; consequently the splenic enlargement was in each case mistaken for an ovarian tumour.

Similar cases have also been recorded by Ashby,[2] Gray Croly,[3] Pozzi,[4] Bland-Sutton,[5] Richelot,[6] and others.

Two cases are on record—those of Dietl[7] and Rezel[8]—in which the enlarged spleen was even considered to be the pregnant uterus.

Case I.* E.B., a married woman, aged 32, was admitted into Chelsea Hospital for Women, under the care of Dr. W. H. Fenton, on January 1st, 1904, complaining of pain in the left side, accompanied by sickness and diarrhœa. She had had two children, the last fifteen months prior to admission into hospital. At this confinement

* Shown at Obstet Soc., London, May, 1904.

she was kept in bed for six weeks on account of "septic fever." Whilst then lying in bed she first noticed a lump in the right iliac region, and she experienced a good deal of pain in the same situation.

In September, 1903, she attended as an out-patient, and was then found to have a hard mass in the right iliac region, extending inwards as far as the middle line of the abdomen, and upwards as far as the umbilicus. She was recommended to become an in-patient but refused to do so. From this time until admission in January last, she has had a good deal of sickness and diarrhœa, having had two very severe attacks on Christmas Eve, and on New Year's Eve, and these she called "bilious attacks."

The catamenia were regular, lasting seven days out of every twenty-eight, and the loss was fairly profuse, and unaccompanied by pain or clots. Between the periods there was some creamy-white vaginal discharge. Micturition was normal throughout.

On physical examination the heart and lungs were found to be normal. The surface of the abdomen was dark in colour, and there was some intestinal distension in the umbilical region. Below the level of the umbilicus, and chiefly on the right side, but also extending across the middle line towards the left, was a hard, firm mass, rising up in the right flank almost to the level of the umbilicus. It was extremely tender on deep palpation. Its surface was smooth and uniform. It presented a well-defined edge, in which no notch could be felt, neither could any movement be elicited.

Per vaginam a hard mass was felt to occupy the anterior fornix; it also extended to the left, forming a very large tumour; it was very tender, and only very slight movement could be induced. The uterus occupied the pouch of Douglas behind the tumour, with which it had no connection.

The history of the case, the apparent origin of the swelling during a septic puerperium, and the presence of a hard mass in the pelvis suggested the diagnosis of parametritis. The definiteness of the swelling and the presence of slight mobility entirely negatived this view. The fact that the tumour occupied the pelvis and was free from the uterus caused it to be diagnosed as an ovarian tumour. The patient's general condition was so bad that operation was deferred until February 19th. In the interval she was kept in bed, and with skilful nursing and appropriate treatment she improved very considerably.

On February 19th, Dr. Fenton opened the abdomen through a sub-umbilical median incision, and found the tumour to be an enlarged spleen embedded in the right side of the pelvis and extend-

ing up into the right iliac region. After separating the adhesions, the pedicle of the spleen was found to be twisted through two-and-a-half complete turns. The tail of the pancreas was contained in the pedicle, and extended to within two inches of the spleen. The portion of the pedicle intervening between the tip of the tail of the pancreas and the spleen, was ligatured by transfixion and cut through, the spleen being thus removed. The abdominal wound was sewn up in three layers. Except that for a couple of days after operation the patient was somewhat restless, recovery was uneventful, the temperature never reaching beyond 99·8°F., and only touching this figure once on the day following operation. The wound healed *per primam* throughout, and the stitches were removed on the eighth day. The patient left the hospital perfectly well on March 10th, that is twenty days after the splenectomy.

Examination of the specimen removed showed it to be a uniformly enlarged spleen measuring 8½ inches in length, 5½ inches in breadth, and 3 inches in thickness. It weighed 41 ounces. It was softish and elastic in consistence and dark purple in colour. Its peritoneal surface was smooth or glistening and free from adhesions. It was hardened whole in formalin. On being bisected it presented a striking appearance. The whole of the central part of the tumour, forming the major portion of it, was seen to be composed of a large hæmorrhagic mass, bright red in colour. Round this a thin layer of splenic tissue of a dark-brown hue was spread out, with larger accumulations at each end. The capsule of the spleen is also thickened.

The changes observed on microscopic examination are the presence of a large central hæmorrhagic mass in which no trace of splenic tissue is discernible, which is surrounded by splenic tissue, with increased trabecular connective tissue and thickening of the connective tissue capsule.

Case II.* S.B., married, aged 29, was admitted into Chelsea Hospital for Women under the care of Dr. Victor Bonney on Sept. 18th, 1904, complaining of a more or less constant dull, aching pain, in the left side, in the back, and in the legs. This had been present on and off for several years and had several times caused her to seek medical advice; it was always considered to be, and was treated as, indigestion and flatulence. The patient had never had any children or miscarriages, but had only been married six months. Menstruation was always regular until the last period, which appeared on Aug. 28th,

* Shown at Obstet. Soc., London, February, 1905

a fortnight earlier than usual, and was very profuse, several small clots being passed. It lasted fifteen days, and was accompanied by great pain, so that on the first day of the period the patient had to lie in bed. There was also marked constipation.

On admission a systolic bruit was heard at the apex. The lungs were normal. There was some resistance and tenderness on palpation in the left iliac fossa; otherwise abdominal examination was negative.

Per vaginam the cervix was felt low down and forward, the uterus being retroverted. It was also tender and slightly enlarged. In the left lateral and anterior fornices a softish tumour about the size of a hen's egg could be felt. It was tender on pressure.

On September 20th these findings were confirmed by examination under an anæsthetic, and the swelling was diagnosed as a cystic tumour of the left ovary, lying in front of and causing retroversion of the uterus.

On September 27th Dr. Bonney opened the abdomen in the middle line below the umbilicus. The enlarged spleen was found in the left side of the pelvis in front of the body of the uterus, which was lying retroverted. The pedicle of the spleen was slightly twisted. This was transfixed by a silk ligature and the spleen was then removed. There were some adhesions round the left ovary and tube; these were broken down. The uterus was freed and lifted up into position. The right appendages appeared to be quite healthy. Recovery was rapid and uneventful and patient left the hospital quite well on October 13th, 1904.

The spleen, after removal, measured along its convexity $6\frac{1}{4}$ in. × 3 in.; it weighed 8 ounces. Its peritoneal surface was rough and ragged from peri-splenitis. The notch was peculiarly situated near one end of the organ, and was so deep that it almost entirely cut off that end of the spleen. Had the notch extended a little deeper a portion of the spleen would have been completely detached and would then have formed an accessory spleen. Section of the spleen showed it to be composed of normal splenic tissue.

Cases of this description, that is to say, cases in which the displaced spleen rests upon the body of the uterus and by its superincumbent weight brings about a retro-displacement of that organ, are very few in number, the only cases of which I have been able to find any record being those of Bland-Sutton,[9] Clarence Webster,[10] Runge,[11] and Plücker.[12] A still more unusual case is that of Klein,[13] in which the pelvic spleen was considered to be the retroflexed fundus of the uterus, and had accordingly been treated with a ring pessary.

It is unfortunate that in neither of these cases was any blood examination undertaken, as this would probably have thrown some light upon the nature of the splenic enlargement. Nevertheless, there seems little doubt that in the first case, as the specimen shows, the enlargement of the spleen was due to the hæmorrhage caused by the torsion of the pedicle. It is possible that the attacks of pain and sickness which the patient described as "bilious attacks" were in reality caused by distinct and separate hæmorrhages into the spleen.

In the second case, neither the clinical history nor the appearance of the spleen itself suggests any factor of ætiological significance, either as to the enlargement or the displacement of the spleen. The perisplenitis, as evidenced by the thickened and ragged state of the capsule, was probably a secondary phenomenon which arose whilst the enlarged spleen occupied its acquired position in the pelvis.

Finally it is my pleasant duty to place on record my thanks to Dr. Fenton and Dr. Bonney, for their kindness in allowing me to publish these cases.

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Epitome of a paper entitled "An Investigation into the Causation of Puerperal Infections."*

BY

ALEXANDER G. R. FOULERTON, F.R.C.S., D.P.H. (Cantab.),

AND

VICTOR BONNEY, M.S., M.D., B.Sc. (Lond.), F.R.C.S.

ALTHOUGH a considerable amount of work has been done in the bacteriology of the puerperal infections of the uterus, the results obtained by different investigations have differed in a remarkable degree. We therefore began a systematic investigation into the causation of puerperal infections some four years ago, which has extended up to the date of publishing this paper.

The cases investigated consisted of:—

1. Twelve cases in which the puerperium was normal.
2. Fifty-four cases of either miscarriage or labour at full-term, in which fever occurred.
3. Thirty cases of cervicitis in non-pregnant women.

These cases were obtained from a variety of sources. Of the puerperal cases 14 were inmates of a lying-in hospital, whilst the remainder came from the extern department at general hospitals and the private practice of various medical men.

The cases of cervicitis were mostly derived from the out-patient department of the Chelsea Hospital for Women.

Method of obtaining Contents of Uterus for Examination.

A large glass tube, of the shape and dimensions of an intra-uterine douche tube, served as a sheath for a wire with a plug of sterilised cotton wool at its extremity. The upper end of the glass tube was covered with a cap of cotton wool. After sterilisation of the apparatus, the cap of cotton wool was dipped in a mixture of melted paraffin and thymol. After the glass tube had been introduced into the lower part of the uterus the cotton wool cap was withdrawn by means of a piece of string, the wire carrying the sterilised plug of cotton wool was then pushed up to the fundus, and a sample of the contents of the uterus thus obtained. The writers hold that the number of sterile cases obtained proves the accuracy of this method. All these cases were fully investigated as regards the bacteriological

* Read before the Obstetrical Society of London, Jan., 1905.

condition of the uterine canal, and in addition samples of the vaginal discharge were examined in most of the cases with sufficient minuteness to control the results obtained from uterine examination. We claim for our series of cases a special value in view of the fact that they represent fairly the average type of case occurring in general practice, whereas previous investigators have relied on the results obtained from inmates of lying-in hospitals, in whom, on account of the aseptic methods in use at such institutions, the severer types of puerperal infection have been nearly abolished.

The Uterus in the Normal Puerperium.

In all the 12 cases presenting a normal puerperium the cavity was found sterile.

While not claiming from this short series alone the right to pronounce the uterus sterile in the normal puerperium, we found that our results in the main corroborate to those obtained by other workers, and whilst unwilling to dogmatise upon this point, we consider that the balance of evidence is largely on the side of sterility.

The Uterus in the Febrile Puerperium.

Fifty-four cases presenting fever in the puerperium were investigated, forty-eight after labour at full term, and six after premature labour or miscarriage.

At the termination of this investigation the cases were separated into three groups in accordance with the severity of the symptoms.

These groups were:—

A. Cases with severe symptoms terminating in death.
B. Cases with severe symptoms terminating in recovery.
C. Slight fever cases (temperature not exceeding 102°F), the pyrexia being the only leading symptom.

The bacteriological results of these cases as regards the condition of the uterus were as follows:—

	Sterile.	Bacteria found.	Total.
Group *A*	—	..... 14	14
Group *B*	5	..... 21	26
Group *C*	10	..... 4	14

Group A.

Bacteria, as will be seen, were found in the uterus in every case included in this group. The organisms found were as follows:—

Streptococcus in pure culture	2 cases.
Streptococcus and B coli communis	5 „
Streptococcus, staphylococcus pyogenes albus and B coli communis	2 „
Streptococcus, B coli communis and an unidentified bacillus	1 „
Diplococcus (+gram) ? micrococcus pneumoniæ in pure culture	1 „
Micrococcus pneumoniæ, B coli communis and staphylococcus pyogenes albus	2 „
Diplococcus (−gram) but not m. gonorrhœa in pure culture	1 „
Total	14 cases.

Amongst this group then the streptococcus takes a very prominent place, and we also desire to note the presence of the micrococcus pneumoniæ with a frequency not obtained by previous investigators. In 12 out of the 14 cases it will be seen that organisms of known pathogenic activity were present.

Group B.

The uterus contained organisms in 21 out of 26 cases comprising this group.

These organisms were as follows:—

Streptococcus in pure culture	8 cases.
Streptococcus and B coli communis	1 „
Streptococcus and staphylococcus pyogenes albus	4 „
Streptococcus, B coli communis and B pyocyaneus	1 „
Streptococcus, staphylococcus pyogenes albus and an unidentified bacillus	1 „
Micrococcus pneumoniæ in pure culture	1 „
Micrococcus pneumoniæ and B coli communis	1 „
A diplococcus (? micrococcus pneumoniæ) and B coli communis	1 „
Staphylococcus pyogenes aureus and B coli communis ...	1 „
A bacillus of the "diphtheroid" group in pure culture ...	1 „
A bacillus of the "diphtheroid" group and another unidentified bacillus	1 „
Total	21 cases.

In this group again the streptococcus predominates and the presence of micrococcus pneumoniæ is to be noted.

As regards the five sterile cases included in this group, the vaginal examination showed an infection of this part of the genital canal with the streptococcus in two of them, so that 20 of the 26

patients were proved to be infected with organisms of known pathogenic intensity.

Group C.

The most striking feature of this group is the presence of so many sterile cases—10 out of 14. In those cases in which the uterine cavity contained organisms the following were found:—

Staphylococcus pyogenes albus	1 case.
Staphylococcus pyogenes albus and B coli communis... ...	2 cases.
A diplococcus (−gram) but not M. gonorrhœa	1 case.
Total	4 cases.

A remarkable point concerning this group of cases is the large proportion of primiparæ which it contained, in all of whom more or less severe lacerations of the vagina or perinæum were present. This strengthens the view that in this group the seat of infection was the lower part of the genital canal.

Examination of the Cervical Secretion in Non-Pregnant Women Suffering from Cervicitis.

Thirty cases were examined; of these

Cultures of bacteria were obtained in	16 cases.
Bacteria were demonstrated by microscopic examination, but attempts at culture failed in...	3 „
Attempts at culture failed and no bacteria were seen on microscopic examination in...	9 „
Attempts at culture failed and no microscopic examination was made in	2 „
Total	30 cases.

Amongst the bacteria found were: Staphylococcus pyogenes aureus, and albus, micrococcus gonorrhœa, B. coli communis, a "diphtheroid" bacillus, a diplococcus (−gram, but not M. gonorrhœa), and an encapsuled diplococcus (+gram ? micrococcus pneumoniæ).

General Results of Bacteriological Examination.

These may be stated as follows:—

The general results of the bacteriological examinations which have been made are—

1. Streptococci were present in the uterus in twenty-five out of thirty-nine cases in which cultures from the contents of the uterus were obtained.

2. Streptococci were present in the vagina in two cases out of seventeen in which the contents of the uterus were apparently sterile.

3. Streptococci were present in the uterus in twenty-five out of forty cases of severe fever, and in the vaginal secretion in two out of five similar cases in which the contents of the uterus were sterile.

4. Out of fourteen cases of "slight" fever the contents of the uterus were sterile in ten, and cultures of bacteria were obtained in four, but not a streptococcus.

5. Of the fifteen cases in which the contents of the uterus were sterile, a marked proportion were primiparæ presenting considerable lacerations of the cervix or perinæum.

6. The presence of *micrococcus pneumoniæ* was proved in four of the cases, and in two others it was probably present.

7. In the present series the absence of *M. gonorrhœa* and anærobic organisms was noticeable.

8. In the series of cases in which the cervical secretion was examined proof was obtained of the presence in the cervical canal of non-pregnant women of bacteria, which had also been found in puerperal infections of the uterus; but in no case were streptococci found.

We specially note the apparent absence of primary infection of the uterus with B. coli communis. As a secondary infection it might be held to accentuate the symptoms from a superficial survey of the group of cases comprised under the heading A; but we do not feel justified in making any pronouncement on this head from such a short series. In regard to the absence of the micrococcus gonorrhœa and anærobic organisms from this series of cases, our own results must be compared with those of Krönig, Whitridge-Williams and Vogel.

Although in a small proportion of cases a possible fallacy in these points may be present, yet we are assured that in the large majority such organisms were certainly not present. The fact that in the majority of cases the cause of the symptoms could be with reason ascribed to organisms of known pathogenic activity is important. These results tend to show that whilst puerperal infection may be autogenetic the bulk of the cases are due to infection conveyed from without.

The Pathology of Puerperal Infection.

The following classification is proposed:—

1. Puerperal fevers may be caused by
   (*a*) Primary infection of lacerations of the vaginal walls or perinæl tissues (sometimes with secondary infection of the uterus).
   (*b*) Primary infection of the contents of the uterus or of the placental site.

2. The processes concerned in the production of puerperal fevers may be classified as

(*a*) Primary, vaginal, or perineal infection. { Local infection + toxæmia; Local infection + toxæmia, + general infection.

(*b*) Primary infection of uterus. { Local infection + toxæmia; Local infection + toxæmia, + general infection.

Conclusions.

1. Puerperal fever when bacteriological proof of the nature of the infection is wanting should be treated as being due to streptococcic infection.

2. Active curetting of the uterus in puerperal infections is not to be advised.

3. The most satisfactory treatment for streptococcic infections of the uterus is comprised in the administration of an appropriate antistreptococcic serum, and digital exploration and clearing out of the contents of the uterus, followed by intra-uterine douches.

4. The fever following a streptococcic infection of the uterus may be transient, and subside within forty-eight hours without any special treatment—a fact to be remembered when dealing with the conveyance of infection.

5. Autogenetic infection is probably sometimes a cause of puerperal fever, but the use of vaginal douching before labour with the view of obtaining asepsis is not advisable.

6. In this series of cases bacterial invasion of the uterus has always been marked by severe symptoms with abrupt rise of temperature to 102° F., or higher.

7. In the majority of the cases in which the contents of the uterus were sterile, and there were severe lacerations of the cervix or perinæum, the symptoms were very much less severe, and the temperature did not rise to above 102° F.

REVIEW OF CURRENT LITERATURE.

OBSTETRICS.

The Artificial Termination of Pregnancy by the Bougie Method.

JACOBY. *Archiv für Gyn.*, 1904. Bd. lxxiv., Ht. 2.

HEYMAN reported 107 cases of labour induced in the Manheim clinic (*Archiv. f. Gyn.*, Bd. 59, Ht. 2) up to the year 1899, and Jacoby now records 121 cases from the same clinic which have occurred since that date. He thus has 228 cases on which to base his conclusions. He deals first with cases in which the indication was pelvic contraction. Of these there were 31 in Heyman's series and 50 in that of Jacoby—81 in all. Tables are given showing that the fœtal mortality varies directly with the degree of pelvic contraction and with the shortness of gestation. The futility of inducing labour in contracted pelves before the 35th week is clearly shown, also the bad results of operative delivery after induction.

Of Jacoby's 50 children 35 were born alive and 31 of these were discharged from hospital alive (65 per cent., as compared with Heyman's 64·3 per cent.). Three mothers were lost out of the 50 cases, one from hæmorrhage two hours after labour, one on the 9th day, of sepsis, and one on the 5th day, of peritonitis. As to previous labours of the same patients, six of the women were primiparæ, the other 44 had had 113 labours, 52 of which ended spontaneously. There were 42 children born alive, 27 of whom are living (27·3 per cent. Heyman's series, 20 per cent.). The writer also compares the results of induction in contracted pelvis with the results of delivery at term in the same hospital of other women with contracted pelves. Apart from Cæsarean section the methods employed in this clinic have given results much inferior to the induction of premature labour. The writer consequently attacks Krönig's dictum that induction should have no place in the therapy of contracted pelvis.

The second portion of the paper deals with the interruption of pregnancy at any stage on behalf of the mother. The indications that occurred were eclampsia, nephritis, heart disease, phthisis, mental disease, hyperemesis, prolapsus, hydramnios, and hæmorrhage and fever following death of the fœtus.

The method of interrupting pregnancy both in contracted pelvis and in maternal disease was the introduction of one or more bougies.

The writer considers this the simplest, safest and best method. He condemns the use of bags, saying that their use constitutes accouchement forcé and is not a true induction of natural labour. His results, however, are much inferior to those secured by bags used simply and purely to bring on pains. Thus the average time during which bougies remained in utero was 24 hours, and the average duration of labour was 31·45 hours in Jacoby's and 35·75 hours in Heyman's cases. There was a death following induction of labour by this method in a case of hydramnios, the bougie being left 54 hours in utero. Excluding chronic cases there appears to have been a morbidity of 8·48 per cent. The writer considers this slow method of inducing labour to be of immense value in the interruption of pregnancy in cases not so urgent as to demand accouchement forcé. The reader, however, will probably form the opinion that quicker and more certain methods might have been employed with advantage in a large proportion of the cases analysed.

W. E. Fothergill.

Hebotomy (Extra-median Symphysiotomy).

Velde (Van der). *Annals of Gynecology and Pediatry*, October, 1904. Vol. xvii., No. 10.

Since his article in the *Zentral. für Gynäkol.*, 1902, No. 37, Dr. Van der Velde has performed three hebotomies. His conclusions from the first of these operations, his third case, are set forth in his article "Hebotomy with Permanent Enlargement of the Pelvis," *Nederl. Tidsche v. Geneesk*, 1903, Bd. 1, No. 22, and *Wiener klin. Wochnschr.*, 1903, No. 29, but he failed to give a suitable history of the case. This he does now, but before doing so he refers to the patient upon whom he performed hebotomy for the first time. She again became pregnant, the pregnancy ran a normal course, and only a narrow scar on the skin, very difficult of recognition, could be seen. The superfluous portion of the callus had entirely disappeared. At term, under anæsthesia, the child was delivered without any great difficulty.

The history of his third case is as follows:—Very small primipara, thirty years old. Vertex presentation. Pelvis flat, rachitic, circumference 75 c.m.; anterior superior spine to symphysis, left 17 c.m., right 17c.m. Diagonal conjugate 9½c.m. Membranes ruptured. Labour started 24 hours previously. Head fixed in the pelvis, presentation occiput to the left, post. part of parietal bone presenting. Pains powerful. After three hours, the head remaining impacted, chloroform was given and hebotomy performed. Immediately after

separation of the bone the sawed surfaces spread 3 to 4c.m. apart. Very little blood was lost; the wound was separated from the birth canal; the fascia was uninjured. The head was pressed through the brim by Hofmeier's manipulation, the divided ends of the bone separating 5c.m.; the pelvis was then pressed together and the head delivered with forceps. The muscles of the pelvic floor and the narrow vulvo-vaginal ring caused so much resistance that a deep incision had to be made obliquely to the right and downwards, but there was no tearing through the soft parts towards the hebotomy wound. The child was alive; bi-parietal 10¼c.m., bi-temporal 9c.m. After delivery the edges were partly drawn together, and a diastasis of a good finger's breadth was left between the sawed surfaces. After three weeks the patient walked well. On examination later it was found that a firm callus united the sundered edges immovably, and that the formerly symmetrical pelvis was now unsymmetrical. The distance from the anterior superior spine to symphysis was 17c.m. on the right side, 19c.m. on the left. The patient, in May, 1904, was again pregnant, no callus could be felt, and there was nothing to show that an operation had been performed except the asymmetry and enlargement of the pelvis.

The fourth case was one of twin pregnancy. The patient had had previously one living child with forceps, and one dead one. Pelvis flat, rachitic. Ilio-pubic distance 14c.m. on both sides. Diagonal conjugate 9¼c.m. Patient was placed in the gynæcological position, shaved, and a compress put over the vulva. Chloroform being administered, the skin was incised two fingers' breadth to the right of the median line, beginning at the upper border of the os pubis, running downwards and inwards through the outer side of the labium majus to below the border of the pubic bone. Very little bleeding. The fat in the lower angle of the wound was then pushed on one side by the index finger of the left hand which then passed to the edge of the pubic bone, where it remained, and guided the needle which was introduced easily round the os pubis by the right hand. The point emerged from behind through the muscular attachments on the upper border. When the needle was visible at the upper angle of the wound Giglio's saw was hooked on to it, the instrument was withdrawn and the bone was quite simply sawn through in a few strokes. It bled but very little during the sawing, about 40 ozs. of blood being lost altogether. The saw was then withdrawn, the wound covered with a compress and the first child easily delivered; the second child came directly after, and then the placenta was expressed. Post-partum hæmorrhage became so serious that the

uterus had to be packed. The hebotomy wound was then sutured. Two sand-bags were put on each side of the patient when she was in bed. As is usually the case, there was slight œdema of the labium after. By the eighth day the separated edges of the bone were fixed by callus. On the tenth day the patient moved her legs. As a result of the operation the right ilio-pubic distance was increased by 1½c.m.

The fifth case was done under local anæsthesia only, and is fully described.

The author considers hebotomy much preferable to symphysiotomy, because the pelvis remains permanently enlarged; in symphysiotomy it may only be temporarily enlarged, whilst the cut ends of the symphysis may fail to unite, so that the patient cannot walk, or may only be united by fibrous tissue which impairs the solidity of the pelvis.

COMYNS BERKELEY.

Concerning the Alleged Peptonuria in Pregnancy, in Labour, and in the Puerperium.

POGGIANI (ADOLFO). *Annali di Ostet. e Ginecol.*, September, 1904.

THE author examined the urine of a large number of women, during pregnancy, in labour, and in the puerperium, for the presence of Kühne's peptone. Altogether 955 separate examinations of the urine were made. The following results are given:—

1. In none of the 955 examinations for Kühne's peptone in pregnancy, labour, or in the puerperium, was a positive result obtained.

2. The secondary albumoses were only occasionally present in pregnancy; the urine of 33 pregnant women was examined, and in 13 only was albumose found; and of 358 examinations a positive reaction was obtained fifty times—14·04 per cent.

3. Of 47 examinations of the urine during labour only seven showed albumose.

4. The presence of secondary albumose in the urine of puerperal women was much more frequent; during the first ten or fourteen days of the puerperium 701 examinations were made on the urine of 72 puerperal women, and 57 of these women showed albumosuria in 265 examinations.

The following conclusions may be stated:—

1. During pregnancy, labour and the puerperium, peptonuria does not exist, but albumosuria is sometimes present.

2. Albumosuria is rare in pregnancy.

3. Albumosuria is exceedingly rare during the course of labour.

4. Albumosuria is pretty common during the first 9 days of the puerperium; the maximum of frequency is at the fourth day.

5. With regard to the genesis of albumose, the greatest importance must be ascribed to the phenomena accompanying the involution of the uterus.

OLIPHANT NICHOLSON.

A Pregnancy Toxæmia of the Central Nervous System.

BRAUER (L.). *Münch. med. Wchnschr.*, 1904. No. 26.

Two years ago the author described the case of a woman who, with each pregnancy, developed hæmoglobinuria, icterus, and general nervous symptoms during the last month of gestation. This form of illness was confirmed by Meinhold, and also by Schmorl. Shortly after his first observation, Brauer came across a case of recurring icterus in pregnancy, without simultaneous hæmoglobinuria, which was fully described in Hegar's *Beiträge*. He thought it possible to bring these symptoms into definite etiological relationship with the processes of metabolism during pregnancy, and thus range them in one large group along with pregnancy kidney, eclampsia, and acute yellow atrophy of the liver.

To this chain Brauer now adds a further link, that this is a disease of the central nervous system dependent on the processes of pregnancy—an example of the effects of a pregnancy toxæmia.

The patient had had sixteen labours, from which ten children were born alive. When five months advanced in her fifteenth pregnancy she complained of rheumatic pains in both legs, and formication. There was no "girdle" sensation. Soon afterwards the right arm and leg became paretic, and in the last month of pregnancy the paralysis involved the left side also. The labour was normal and was followed by speedy improvement. In a month the patient could walk about, and two months later was quite well.

About two years later the next confinement took place. During the first and second months of this pregnancy there was an uncomfortable sensation in the feet, and headaches were also complained of. Between the fifth and sixth months there was marked dragging of the right foot, and soon the woman could only walk a few steps. There was formication confined to the right side. Up to nearly full time the paralysis steadily increased, and both sides of the body were then completely paralysed. Dyspnœa was present in the last weeks, there was partial aphonia, but no speech or eye disturbances were

noted. Insomnia was marked. Accompanying the paralysis, cramp-like pains—at first slight, and later on very severe—were complained of. As labour was nearing term, dropsy of the legs and arms appeared, but the face was not affected. There was no albumen in the urine.

One month after labour the patient could move her head and legs, and the formication was gone. Examination showed that she was anæmic. The cranial nerves were normal; no nystagmus or ocular paralysis. The right arm was completely paralysed; the muscles were tonically contracted; and anæsthesia was also present. Although the patient was emaciated, there was no atrophy of the muscles. Tendon and deep reflexes were increased. Babinski's sign was present on both sides.

The case is of interest, both on account of the peculiar etiology, and also for the mixed nerve symptoms present. There was undoubtedly a lesion in the upper cervical cord, and that lesion was probably a myelitis in the wider sense of the word. Hysteria can be excluded. The complete cure of the first mild attack, the complete cure also of the second more severe attack, and the slowly progressive symptoms in each case, all go against the theory of a simple inflammatory myelitis with destruction of tissue. There is much that points to the case being one of multiple sclerosis—atypical, and essentially spinal—for it is known that this disease can account for the most diverse symptoms, and in its origin and progress is not seldom found in dependence on pregnancy. The absence of nystagmus, scanning speech, and intention tremor go against this diagnosis. Brauer prefers to regard the case as a "toxic myelitis," in which there was a degeneration of the nerve elements, but no inflammatory process.

Other pregnancy toxæmias have been described in literature, such as neuritis multiplex, which is usually found in combination with hyperemesis. Stiefel mentions the case of a ii.-para, twenty-four years of age, where at the seventh month multiple neuritis appeared. Pain and paresis were present, with loss of patellar reflexes, and diminution of the skin reflexes. After delivery cure rapidly occurred. A more frequent disease of the nervous system in pregnancy is chorea gravidarum, and with it one might class pregnancy psychoses, and also tetany. Finally, simple neuralgias may be mentioned. It seems clear that we must likewise regard pregnancy kidney, hyperemesis, and eclampsia as typical toxic conditions.

There are other diseases in more indirect dependence on pregnancy, for example, exophthalmic goitre. Sometimes this disease comes on during pregnancy; sometimes it gets worse during this period;

occasionally it gets very much better. These statements are of interest in going to prove that some important relationship exists between the thyroid gland and pregnancy. Swelling of the thyroid during pregnancy is known to occur, and the gland again diminishes in size after delivery. The enlargement appears first at the sixth month, just at the time that the toxins of pregnancy develop. Lange carried out an important experimental investigation into this question, which showed valuable results.

Despite all the work that has already been done, it still remains to make clear what processes are responsible for the onset of these toxic conditions during the period of pregnancy. Recent researches on eclampsia, pregnancy kidney, and hyperemesis gravidarum have thrown some suggestive light on the subject.

OLIPHANT NICHOLSON.

Ovarian Changes in Vesicular Disease of the Chorion and in Normal Pregnancy.

WALLART (J.). *Zentral. für Gynäkol.*, 1905, No. 1.

THE writer describes the case of a patient, aged 29 years, who, one year after the expulsion of a vesicular mole, was found to have developed a malignant tumour of the uterus. After death the ovaries were examined. The theca interna contained many lutein cysts and an excess of lutein tissue arranged in irregular masses. The author has lately investigated the ovaries of six patients in the puerperium, and has found that many follicles are surrounded by an epithelioid tissue similar to lutein tissue in every respect. These follicles varied in size from the bulk of a linseed to that of a hazel nut. Solid masses of epithelioid cells were also found. Therefore in normal pregnancy as well as in vesicular mole we get an over-production of lutein tissue.

CUTHBERT LOCKYER.

Pregnancy and Labour in Primiparæ of 13, 14, 15 and 16 years of age (observations at Buenos Ayres).

GACHE (SAMUEL). *Annales de Gynécol. et d'Obstét.*, December, 1904.

THE author made observations on ninety-one cases of pregnancy occurring in young girls, who lived in the poorer parts of the town of Buenos-Ayres, and who had generally been kept hard at work from an early age. He deduces the following conclusions:—

1. The girls of 13, 14, 15, and 16 years of age are no more liable to abort, and are not more subject to the complications of pregnancy than others.

2. Among the ninety-one cases observed there was only one badly contracted pelvis, owing to faulty development, and three others slightly contracted. In all these cases delivery was completed with the help of the forceps.

3. Labour in the other cases followed a normal course; it was merely noted that the duration was longer than the average.

4. In the ninety-one cases the head presented 85 times, the breech five times, and one case aborted at three months.

5. Indications for the use of the forceps were present on six occasions; three times for slight contraction of the pelvis, and three times because the labour was unduly protracted.

6. Vulvo-vaginal and perineal lacerations were rare, and, when they occurred, healed rapidly.

7. So far as was observed the placenta was never inserted on the lower segment of the uterus.

8. The puerperium was uniformly normal.

9. The average weight of the fœtus was 3,039 grammes.

10. The proportion of sexes was nearly equal, 44 boys and 45 girls.

OLIPHANT NICHOLSON.

The Treatment of Puerperal Eclampsia by Thyroidin.

GOMOT. *Annales Médico-Chirurgicales du Centre*, Jan. 15th, 1905.

IN the June (1904) number of the above, Dr. Léon Cerf, of Angers, published a critical review dealing with the use of thyroid substance, both as a prophylactic measure in cases of impending eclampsia, and also as a remedy after convulsions have occurred. He concluded his review by expressing the hope that his colleagues would endeavour to study more fully the whole question of the relations of the thyroid gland to the pregnant state. Dr. Gomot now records an interesting case of eclampsia in which thyroid was administered.

On September 16th, 1904, he was called to a primipara, thirty-five years of age, and 7½ months pregnant. She complained of violent headache, had continual nausea, and was very drowsy. Her face was pale and the eyes were puffy. The legs were also much swollen, and the œdema extended as far as the thighs. The urine, which had been scanty for some days, became solid when it was boiled. The patient was put on an absolute milk diet, and diuretics were ordered.

Next day (September 17th), eclamptic fits, as anticipated, came on. They were so violent and frequent that chloroform had to be given, and this was followed later by chloral, in an enema, every 2 hours. The quantity of albumen in the urine at this time was 12 grammes per litre. All that day the condition was very grave; the temperature was between 102° and 104°, and the pulse 115 per minute. The fœtal heart sounds were still perceptible, but very weak.

On September 18th an enema of warm water was given, after which the patient became more conscious and could swallow a little liquid. Eight tablets of thyroidin (Bouty) were given during the next 24 hours, and the same dose was repeated on the following day; then six tablets were given daily. The quantity of albumen in the urine was carefully estimated while this treatment was being carried out.

On September 19th the albumen had diminished to 8 grammes per litre, and the patient's sight, which had been lost on the first day of the attack, returned. The fœtus was still alive. The cervix showed no signs of commencing dilatation. On September 20th the albumen was down to 5 grammes per litre, headache was much better, and the quantity of urine was very greatly increased. The skin, previously dry, now became moist, and the temperature was normal. On October 1st the quantity of albumen in the urine had fallen to 2 grammes per litre, and at this it remained, in spite of the combination of milk diet and thyroid, up to the day of delivery on October 15th. At the time of her confinement, the patient was in good general condition, a result, Gomot believes, of the thyroid medication, and the labour was normal. He mentions the interesting fact, already observed in a case previously recorded, that the actual labour was almost painless. The puerperium was quite normal. The child, which was born alive, weighed only 700 grammes, but has since thriven very well.

Gomot thinks that this case demonstrates the beneficial effects of thyroidin, for in spite of the very severe eclamptic fits, it was not necessary to terminate the pregnancy, and a living child was born a month later.

OLIPHANT NICHOLSON.

Pregnancy Reactions in the Organs of the Fœtus, and their Puerperal Involution.

HALBAN (J.). *Zeits. für Geburts. und Gynäkol.* Bd. liii., Ht. 2.

CERTAIN substances circulating in the maternal blood cause striking changes in the maternal organism. These substances must also

circulate in the fœtal blood. The author examined the organs of female fœtuses and of new-born children, and of a few children from a few weeks to two years old, with the idea of finding out whether these substances produced any reaction in the fœtal organs comparable to that seen in the maternal organs. The results of his investigations are of great interest. He found that uteri of new-born infants show almost without exception a striking amount of hyperæmia. This is so marked in the endometrium that some sections look as if they were taken from injected specimens. The histological appearances are exactly those of the menstruating adult uterus, in fact, Halban says that his sections from new-born uteri could be used for demonstration of typical menstrual changes. He considers that the bleeding from the genitals of infants new-born or a few days old is associated with these changes. These cases of menstruation in the new-born must, of course, be distinguished from cases of precocious menstruation. The ovary apparently has nothing to do with the former genital bleedings, being as a rule absolutely unripe. Halban found in these cases all intermediate changes between menstrual congestion and actual bleeding into the uterine cavity, and considers that microscopical examination of the vaginal secretion of new-born infants would often show the presence of blood. (He selected for examination cases in which asphyxia and infection were absent). It has been pointed out by Bayer that the uterus of a new-born infant is usually larger than that of an older child. Halban finds that these changes in the fœtal uterus begin in the eighth or ninth lunar month. He considers that they are due to some substance circulating in the fœtal blood during intra-uterine life, not to ovarian influence. He does not accept Fraenkel's views that the pregnancy reaction of the maternal organism is due to the influence of the ovary. He hopes to be able to obtain organs from a full-time female fœtus of a woman whose ovaries were removed during pregnancy to prove that the pregnancy reaction is independent of the ovaries. At any rate the corpus luteum can have no part in the production of the pregnancy reaction in the fœtal organs because this reaction is only seen in the later months when the corpus luteum is atrophied.

Bayer's observation points to a puerperal involution of the fœtal organs. Halban's own investigations support this. He finds that the new-born uterus undergoes involution just as does the maternal. About three weeks after birth the puerperal involution of the infant's uterus is complete. The breasts of the fœtus undergo just as marked a change as does the uterus. The glandular epithelium becomes proliferated and many-layered; the individual cells become rounded

and stain badly; the lumen becomes widened and filled with colostrum. In the neighbourhood of the glands are often found hæmorrhages, collections of leucocytes, eosinophile cells and giant cells. A few days after birth the breasts of the new-born infant fill up with milk just as do those of the mother. The breasts of the female infant undergo puerperal involution in the first weeks after birth just like that seen in puerperal women who do not suckle.

Œdema is very common in pregnant women, and usually disappears rapidly after labour. The skin of new-born infants contains more water than that of older children. Œdema of the vulva, and of the scrotum is also common. The pelvic joints of new-born children are much more movable than those of older children. The most marked changes in the blood during pregnancy are leucocytosis and increase in the amount of fibrin. In eclampsia both these changes have been found to be excessive in the blood of both mother and child. What is the source of these substances which cause the pregnancy reaction? If it is in the maternal organism why does involution begin in maternal organs as soon as the child is born? If it is in the fœtus why does involution begin in the fœtal organs as soon as the child is separated from the mother? If it is due to products of fœtal metabolism how are we to explain cases in which, although the fœtus is dead the pregnancy reaction in the mother is unaltered, *e.g.*, cases of missed labour, vesicular mole, etc.? Halban considers that the active "pregnancy substances" have their origin in the placenta, and that they are most likely the internal secretion of the chorionic epithelium. This epithelium is the product of union between spermatozoon and ovum, both specific products of organs which have very active internal secretions. In male infants breast changes are found just as in female infants. In the prostate are seen hæmorrhages, infiltration around the glands, eosinophile and giant cells, proliferation of glandular epithelium, etc. Puerperal involution of the prostate begins in the second or third months.

Halban discusses the bearing of these observations on the subject of eclampsia. In one case of pregnancy nephritis, albumen was found in the urine of the fœtus as well, and many cases have been recorded in which both mother and fœtus had eclampsia. In these toxic conditions he sees an exaggerated degree of the pregnancy reaction, the effect of the internal secretion of the chorionic epithelium. Complicated theories of deportation of villi and the formation of syncytiolysin are unnecessary and unconvincing.

The non-success of injection experiments with placental extract

on animals does not weaken the theory of placental internal secretion, since animals seldom or never suffer from eclampsia.

HENRY RUSSELL ANDREWS.

The Treatment of Puerperal Infection.

Zentral. für Gynäkol., 1905. No. 1.

P. CALCAGNI deals with the subject generally by summing up the treatment of various authorities. He mentions amongst other things the uses of non-proteid diet, alcohol, chinin, camphor and ergotin for internal administration. The use of baths, serum-therapy, subcutaneous and intravenous injection of Koch's solution, the artificial excitation by turpentine injections, of the so-called "fixation abscess" (Fochier), intra-uterine injection of small quantities of alcohol in solution of high percentage, intra-uterine drainage, digital or instrumental curettage, and finally hysterectomy. The author upholds a mixed therapy by which the internal medicinal treatment (milk diet, chinin, brandy, calomel) on the one hand, and the employment of copious intra-uterine douches, salt solution and curettage on the other hand, are of primary importance. Calcagni does not believe in serum-therapy or hysterectomy. His conclusions are based upon the treatment of twenty cases of puerperal infection.

J. Mouchotte treats of hysterectomy in these cases. He says we have as yet no accurate indications for its employment since bacteriological investigations of the lochia and the blood give us no definite prognosis. If in the lochial discharge the presence of one well-known organism is proved, it does not afford constant clinical features, and for the most part the infection is mixed. Further, in cases where streptococci have been found in the blood cure has resulted without operation, whilst in others where the investigation of the blood has been negative death has followed. Our decisions as to treatment must be guided by trying to determine the power of resistance of the patient, *i.e.*, the leucocytic properties of the blood.

Potocki and Lacasse deal with the changes in the blood corpuscles and their influence on the prognosis and treatment of puerperal fever. These authors have tried to settle the question raised by Mouchotte and Carton as to whether blood examinations will aid the clinician in the prognosis of puerperal fever. Their conclusion is that if the leucocytes and polynuclear cells are in large numbers (25,000—30,000, and 80—90 to 100) the prognosis is doubtful. The prognosis becomes very unfavourable if an increase of the white

blood-corpuscles is associated with a rapid diminution or disappearance of eosinophile cells. Improvement in a severe case is always combined with an increase in eosinophiles and a notable decrease in polynuclear cells. In cases where the outlook becomes doubtful owing to a rapid decrease of eosinophiles, a radical operation—hysterectomy or cœliotomy, should be performed.

O. Schaefer comments on the etiology of a case of acute transverse myelitis occurring in the course of puerperal fever. The case was as follows: Puerperal parametritis ended in the bursting of an abscess into bladder and rectum. The swelling cleared up in four weeks. Then, ten weeks after birth, paralysis and anæsthesia from the epigastrium downwards set in, with rapid pulse and wasting. The paresis first occurred on the side corresponding to the parametritis. Could a gradual spread of the parametric process along nerve sheaths or a progressive lymphangitis have been the cause of the myelitis; or could it be due to thrombophlebitis spreading upwards? Either or all of these conditions were anatomically possible, but against this view was the clinical fact that there had been an afebrile interval with a normal pulse rate. The infection may have travelled *via* the arteries, either directly or by anastomosis. The lateral sacral and the ileo-lumbar arteries would unite the abscess area with the spinal vessels; whilst an infective embolus could travel directly *viâ* the hæmorrhoidal and lower sacral vessels and perhaps also along the anastomoses of the deep epigastric with ileo-lumbar. Menstruation probably determined the dislodgement of the infective emboli.

CUTHBERT LOCKYER.

GYNÆCOLOGY.

Blood Accumulations in Double Uterus with Atresia on one Side.

KATZ. *Archiv für Gyn.*, 1904. Bd. lxxiv., Ht. 2.

THE writer describes the case of a woman 26 years of age who had abdominal periodic pain from the age of 14 onwards. At 18 she began to menstruate, her periods lasting 8 days, but the quantity of discharge was small. Acute pain began the day before the discharge and, on the second day of menstruation, was often so severe as to cause fainting. This condition became worse until she sought relief at the age, as mentioned, of 26 years. The cervix was a little to the left and continuous with it was a uterine body on the left of

the middle line; on the right was a cystic body the size of a two months' pregnancy. The pelvis was filled with another tenser cystic body the size of a child's head.

Dr. Abel operated by the vaginal route. The uterus was drawn down through a longitudinal vaginal opening, and the smaller cystic body with it. This was then seen to be a distended right cornu of the uterus. The larger cystic mass was then made to present in the wound and was opened, a large quantity of chocolate-coloured fluid escaping. The distended cornu was then separated from the left cornu and removed together with the right tube and ovary and the wall of the emptied cyst, which proved to be a hæmatosalpinx of the outer portion of the tube. The specimen is described in detail and figured. There was absolute atresia of the cornu removed, whose cavity contained a quantity of old blood and was lined with a uterine mucosa, whose cells, however, were cubical rather than cylindrical in form. The mucosa of the hæmatosalpinx was almost destroyed, its muscular layers were hypertrophied. The ovary was unaltered.

The writer considers the developmental errors by which malformations of the uterus arise, and names the specimen in question as an example of uterus bicornis unicollis. The condition thus is hæmatometra in the atresic horn of a uterus bicornis unicollis. This has been recorded in sixteen previous cases which are next briefly described and tabulated. Hæmatosalpinx complicated the condition in seven of these cases. Several of them were not diagnosed, and one was recognised only at the autopsy. The writer considers, however, that the history of periodic pain with the physical signs forms a clinical picture which should be easily recognised.

A discussion of the etiology of hæmatosalpinx is next given, and the view that organisation of blood closes the abdominal opening of the tube is adopted. The case in favour of inflammatory and infective occlusion is fully given, only to be rejected. The writer also concludes a discussion on the source of the blood in hæmatosalpinx by regarding reflux menstrual blood as playing but a small part, the bulk of the blood being shed by the blood-vessels in the wall of the tube itself owing to certain congestive conditions which are not understood.

The paper is completed by an elaborate discussion of the methods of operative treatment which have been used and which are logically possible in the conditions under consideration. The result of this is simply that the treatment must be suited to the demands of each individual case, and should be as conservative as possible.

W. E. Fothergill.

Embryoma Tubæ.

ORTHMANN (E. G.). *Zentral. für Gynäkol.*, 1905. No. 1.

THE writer finds only three cases of embryoma tubæ on record, and three of these he considers doubtful. Details of the case recorded by himself are as follows. The patient was aged 33 years; she had had two spontaneous deliveries and had been under gynæcological treatment for some years. The right appendages were removed by anterior colpotomy. The tube resembled externally an ordinary retort-shaped sactosalpinx. Internally a solid body five centimetres long was found. It was covered with hair and embedded in dermoid grease. It lay free in the tube except that at the uterine end there was a thin strand of connective tissue connecting it with the tubal mucosa. This brought to the embryoma its only blood supply. A structure of bony consistence resembling a tooth was discovered.

All three layers of the blastoderm were represented by (1) external skin; (2) cerebral tissue; (3) mouth cavity; (4) respiratory tract; (5) lymphatic glands.

Orthmann thinks it probable that this body developed from a pole-cell or a blastomere of the gravid subject.

CUTHBERT LOCKYER.

Gersuny's Subcutaneous Paraffin Injection and its Application to Gynæcology.

STOLZ. *Monats. für Geburts. und Gynäkol.* Bd. xx., Heft 6.

GERSUNY first employed vaseline in 1899 for subcutaneous injection to remedy certain defects, for instance, in raising depressed scars and improving speech defects after cleft palate operations. It was found that there was no tendency for the vaseline to be absorbed even after three years, as the mass became rapidly encapsuled and so remained unaltered. Later Stein employed a mixture of vaseline and hard paraffin melting at 42° to 43°C. instead of vaseline, and later still Eckstein used a still harder paraffin mixture melting at 57° to 60°C. The reasons for using these mixtures with a higher melting point was that it was thought that the vaseline would be absorbed, and that there was a danger of pulmonary embolism with the more easily melting material. The second objection was found to be proved by the experiences of Pfannenstiel, Leison, Halban and others. There does not appear, however, to have been a case of pulmonary embolism in any instance in which the hard paraffin of

Eckstein was used, the reason for this being apparently that the very rapid cooling of the paraffin and therefore hardening in the tissues prevented any such accident. Certain precautions were found to be necessary in the performance of the small operation of injection, especially in regions where many large blood channels existed, chief among them being the injection of a very small quantity, say one centimetre, at first, and then, after waiting a week, to increase the size of this by injecting directly into the first mass. It is of importance, too, not to inject the paraffin until it is certain that no blood issues from the canula. Special injection syringes are necessary for the hard paraffin injections, such as that of Karewski, which has a hot water jacket to prevent cooling of the paraffin in the syringe. In gynæcological practice paraffin injection has been used for the cure of cases of incontinence of urine and of prolapse of the uterus when plastic operations had either failed or were contra-indicated. The first case of incontinence treated by Gersuny was a patient aged 25, who had loss of control of the sphincter vesicæ. Seven attempts at cure by plastic operations failed. It was found that two large folds of bladder mucous membrane prolapsed through the dilated urethra, and although these were easily replaced they could not be retained. Gersuny injected vaseline into these folds, then replaced them and injected more vaseline round the neck of the bladder, with the result that no further prolapse occurred, and complete power of urinary retention was regained. Pfannenstiel, Kapsammer, Wertheim and others described similar cases with more or less good results. The author describes two cases in which similar measures were adopted, in one of which there was a serious laceration of the urethra itself, allowing prolapse of the vesical mucous membrane, and in the other the urethra was intact. In both, however, there was incontinence of urine on standing. The second case was completely cured by injection of paraffin melting at 42°C. around the neck of the bladder. The first case was treated in the same manner, but as a result the patient was unable to pass urine at all, and after catheterisation and dilatation of the opening, at last the neck of the bladder had to be divided, incontinence again resulting. The results in most of these cases were so encouraging that Halban conceived the idea of utilising a similar procedure for the treatment of cystocele. His procedure was to inject about 20—25c.cm. of paraffin in a half ring around the cystocele, putting his needle in the mid-line between bladder and vagina and then directing it into the para-vaginal tissues on each side through the same opening. The results in Halban's cases were good, the patients

being unable to make the vaginal wall prolapse afterwards, even with strong pressure. Similar cases were reported by Gersuny, Eckstein and others, mostly with good results. This method of treatment seems indicated in cases where pessary treatment is useless, where operations either have been of no avail or are contra-indicated, and where no further pregnancy is likely to occur.

THOS. G. STEVENS.

Anæsthesia by means of Skopolamin and Morphia..

ZIFFER. *Monats. für Geburts. und Gynäkol.* Band xxi., Heft. 1.

THERE are objections to the use of, and dangers incurred with, most general anæsthetics, and local anæsthesia is by no means suitable for all patients. The author gives the results of his experience with a mixture of skopolamin and morphia given subcutaneously to produce general anæsthesia. In most cases the mixture was used in combination with small quantities of chloroform by inhalation, but in others the mixture was used alone to produce deep narcosis. The method of use was as follows:—A solution containing ·005 grammes of skopolamin hydrobromide and ·1 grammes of morphia hydrochloride in 10 grammes of water was prepared, and as a rule three or four injections were made at intervals of $2\frac{1}{4}$, $1\frac{1}{4}$ and $\frac{1}{4}$ of an hour before the operation. The dose for each injection was as a rule ·01 grammes of morphia and ·0005 grammes of skopolamin which in our scale of measures means about $\frac{1}{6}$th of a grain of the former to $^1/_{130}$th of a grain of the latter. With this dosage no ill effects from the injections were seen, and the amount of chloroform necessary to produce deep narcosis was on an average only 14 grammes per 100 minutes, whereas in a large series of operations under chloroform alone recorded by Mikulicz it was found that the average amount per 100 minutes was 80 grammes. Other advantages of the method are that there is no danger of syncope, as the action of the heart is greatly increased, there is no danger of over-dosage with chloroform as so little is used, there is hardly any excitation stage, there is no vomiting during the anæsthetisation, and, finally, the patients do not complain of pain on waking.

A very important use of this narcotic mixture is demonstrated by the author, in cases of labour. It must be admitted that there are objections to the use of chloroform on account of its effect on the uterine contractions, and the lowering of the maternal blood-pressure which ensues if narcosis lasts any length of time. Morphia alone will relieve the pains of labour, but such large doses have to be given

that there is great risk of poisoning the fœtus, and the uterine contractions may be decreased. However, combined with skopolamin, neither of these two ill effects occur, and comparatively small doses only need be given. To produce what may be called half narcosis during labour, an injection of 0·003 grammes of skopolamin and 0·01 grammes of morphia was given at the commencement of severe pain; 1½ to 2 hours later a similar injection was given, and as a rule this was sufficient to produce a sleepy condition in which the second stage finished. If this period lasted more than 3½ hours after the second injection, a third might be given with advantage. Under this treatment very little pain was complained of, and it was only by constantly exhorting the patients that they could be made to help matters by voluntary efforts. No ill effects were noted from the injections. The labour pains were normal in 7 cases, increased in 16 and excessive in 6, whilst in no case were they diminished. A slight bleeding took place during the third stage in one case, which was easily controlled by ergotin. The author concludes by giving a table of 64 cases of all kinds in which this injection, combined or not with chloroform, was used. Hè says there is no absolute contra-indication to its use, but at the same time looks upon great frequency of the pulse and diminished frequency of the respiration as a relative contra-indication to further injections if two have been given. In such a case anæsthesia must be concluded by using chloroform. The solution must be freshly made, as the skopolamin soon disintegrates, and by using an old solution one gets the full effect of morphia without the antagonism of the skopolamin, in other words morphia poisoning results.

THOS. G. STEVENS.

A Method of Dispensing with Rubber Gloves and the Adhesive Rubber Dam.

JOHN B. MURPHY (Chicago). *Annals of Gynecology and Pediatry*, October, 1904. Vol. xvii. No. 10.

THE value of this method and in general of rubber gloves when compared with the naked hands is gone into. A series of experiments were undertaken with this object, and the results showed that both rubber solution and rubber gloves have a certain definite advantage over the naked hands with respect to asepsis. Rubber solution is prepared in the following way:—

1. Care must be taken to cut the gutta-percha chips in small pieces.

2. Wash in formalin, full strength, and dry.

3. Macerate the chips in benzine or acetone for three days, then filter through cotton which has been in formalin vapour for 48 hours. Repeat the filtering twice and then the solutions are ready for use. The benzine is sterilized by boiling it in a water-bath in a strong, securely-corked bottle. Repeated culture tests of the solution prepared in this manner all proved sterile; 1 per cent. carbolic acid may be added without producing irritation of the skin, but is unnecessary. Formalin will not mix with the solution, and therefore cannot be used. The solution will not stand boiling as it destroys the adhesiveness. The chloroform and carbon solutions are not advisable as they are too severe on the operator's hands, and are expensive.

The best method of applying is by dipping the hands into a small basin containing the solution. It should be worked in around the nails and tips of the fingers, and should be applied as high as the elbows. Between operations the hands may be washed with soap and water, spirits of soap, alcohol, bichloride, carbolic acid or formalin solution, without interfering with the rubber coating. Brushes, however, should not be used. After cleansing the hands and before proceeding with another operation, the fingers are redipped, as the coating wears off, but one application on the hands and forearms is sufficient for the entire day. The skin of the operator does not become "water logged" or shrivelled with the solution, as it does with the rubber gloves. The coating is best removed by washing the hands in benzine and drying rapidly with a towel.

For practical purposes it seems the best way is to have the sterilised chips in small envelopes the same as dry catgut, having a sufficient quantity in each to make a 4, 8, 12 or 16 ounce solution. The operator can then have sterilised benzine in his operating room and add the gutta-percha, thus making fresh solutions. These, like soft rubber goods, deteriorate with time, and if kept long in a hot room. This is all avoided by keeping a supply of rubber chips as above-mentioned.

COMYNS BERKELEY.

Embolism following Operation.

DEARBORN (SAM S.). *Annals of Gynecology and Pediatry*, November, 1904. Vol. xvii., No. 11.

THE author thinks that the small amount of literature on this subject is due to the fact that the fatal cases on record do not represent the full number of deaths from this cause. In almost all the cases

recorded in full it is an interesting fact that the patients have been doing well; often the cure was considered complete. The author describes fully a case of his own which recovered, and then discusses the complications. According to him thrombosis may result from three conditions:—

1. After a prolonged or severe operation.
2. As a result of sepsis in the wound.
3. Where neither of the above conditions obtain.

The thrombosis differs considerably both as to its type and liability to produce infection, according to its cause. If the thrombosis is due to stagnation of the blood it most commonly occurs about 7 to 10 days after the operation. Schenck in a *resumé* of 7,130 gynæcological operations reports 48 cases of thrombosis. It is more common after operations in the pelvis. Too forcible use of retractors causing injury to large venous trunks may possibly be the cause, in some cases ligature of a vein near its entry to the main trunk. Agnew thinks it is due to loss of blood, the remaining blood being more easily coagulated. The most frequent cause of pulmonary embolism is thrombosis of the veins of the leg due to fever or fracture; next pelvic and abdominal operations, and parturition. Wright and Knabb when investigating post-typhoid thrombosis found that there was a decrease in the coagulation time of the blood during the later stages of the disease, due to the increased amount of calcium salts in the blood. This increase is attributed to the almost exclusively milk diet, which contains a high percentage of these salts. Perhaps this will also account for some of the cases after operation. The consequences of an embolism depend very much on the nature of the embolus, the area of the blood-vessels occluded, and the functions of the organ disturbed.

The branches of the pulmonary artery are most frequently affected, the vessels of the lower lobe of the right lung being most often occluded. Death may be caused absolutely suddenly by syncope; a little less suddenly by asphyxia; or in an hour or two on the first attack of asphyxia having passed off, another and another supervenes and death does not take place for a day or two. A pulmonary embolism which does not cause death too rapidly gives rise to a hæmorrhagic infarction accompanied by pleurisy. It usually commences with a rise of temperature to 102°, falling a little in 24 hours. So that it is possible that many cases of pneumonia, pleurisy, and pulmonary abscess following operation are due to emboli, and therefore when after operation or parturition the patient has an attack of pneumonia or pleurisy great care should be taken to keep her very

quiet. The prospects of recovery depend on the size of the embolus, upon the state of the lungs, and upon the nature of the embolus. Very small emboli, which are not infected with bacteria, usually run a favourable course. In non-septic cases most of the danger of infarction is over in a fortnight; in septic cases the danger is longer, being six weeks or so. Most authorities are agreed that rest is the essential treatment. Strychnine, morphia, and oxygen in some cases have given relief.

With the desire of getting information further than that secured from the journals and text-books, a circular-letter was addressed by Dr. Dearborn to twenty-five of the more prominent surgeons of Boston. Extracts from the replies accompany this paper.

Any sudden increase in pulse rate during convalescence, temperature remaining about normal, should remind one of the possibility of thrombosis.

COMYNS BERKELEY.

REPORTS OF SOCIETIES.

OBSTETRICAL SOCIETY OF LONDON.

Meeting, Wednesday, January 4th, 1905, EDWARD MALINS, M.D., F.R.C.P., *President, in the Chair.*

AN INVESTIGATION INTO THE CAUSATION OF PUERPERAL INFECTIONS.

The paper by Mr. A. G. R. FOULERTON and Dr. VICTOR BONNEY was read.

The writers have examined the contents of the uterus (1) in twelve cases in which the puerperium was normal—examination being made from the third to the tenth day after normal labour, and (2) in fifty-four cases of either miscarriage or labour at full term in which fever occurred.

The writers have also made a bacteriological examination of the cervical secretion in thirty non-pregnant women who were suffering from vaginal discharge. An epitome of this paper will be found on p. 121.

Dr. PETER HORROCKS said that he regarded the pathological fact that the contents of the uterus were found sterile in every instance where the puerperium was normal as another nail in the coffin of interference in labour, such as vaginal or uterine routine syringing. He remarked on the absence of any distinction between septicæmia and sapræmia in the classification adopted by the authors of the paper, who had taken the amount of fever as the sole guide to the severity of the illness. The presence or absence of an offensive discharge was of the greatest moment. In the grave form of puerperal septicæmia proper, the lochia were not offensive, but were suppressed or scanty and sweet. Whereas in sapræmia the lochia were not scanty but were offensive, and when the offending products were cleared out of the uterus the temperature as a rule rapidly fell to normal and the patient recovered. Doubtless, in some cases the patient suffered from a mixed sepsis, and then the clearing out process was not followed by the improvement usually expected. In the severe non-offensive fatal cases it had been his experience that there was always more or less peritonitis, generally suppurative. It was generally accepted that the microbe in these cases was the streptococcus. He should like to know whether it could be detected by examination of the blood. In his experience, the results obtained by the use of anti-streptococcic serum were sometimes excellent and sometimes nil. And so far as he knew, it was impossible to say beforehand whether the serum would do good or not. Hence it was his practice to administer the serum in 10 c.c. or 20 c.c. doses subcutaneously two or three times in 24 hours.

Dr. AMAND ROUTH agreed that streptococci were the most frequent cause of the severer forms of puerperal fever. He had also found many cases of fever where the contents of the uterus were proved to be sterile. Was it possible that some of these cases were infected by moulds, yeasts, or streptothrices, all of which might cause disease? He had very little faith in anti-streptococcic serum, having seen only one case recover by its use, and had much more reliance on Tr. Ferri Perchloridi in 20 or 30 drop doses every two or three hours. He considered that this drug ought to be given as a routine treatment. In all cases also the

uterine cavity should be emptied and strong iodine solution applied all over the endometrium, as soon as infection was suspected.

Dr. SIKES said that he had examined about 20 cases which were all of a mild type. He agreed with the authors of the paper that in such cases one got a negative result; and also that the most frequent association of bacteria was the B. coli communis with staphylococcus pyogenes. With regard to the finding of streptococcus so frequently he was much surprised as from not a single one of his cases had he cultivated the organism from the interior of the uterus. He had been much impressed with the good results obtained by early digital exploration followed by intra-uterine douching, but he considered that the results from anti-streptococcic serum were often unsatisfactory.

Dr. BOXALL agreed with the conclusion that as a rule active curetting of the uterus was not to be recommended. As regarded the use of anti-streptococcic serum he still preserved an open mind. There were many disadvantages in its use, and he had seen considerable danger follow, but never appreciable improvement. Inasmuch as it had been proved that at the time of labour the vagina might contain pathogenic organisms, the presence of which was often unsuspected and difficult to detect, he adhered to the practice of douching the vagina early in the course of labour, with a view to preventing the possibility of autogenetic infection, on the same principle that he took measures to disinfect and render sterile the skin of the abdomen before performing laparotomy. Severe cases of septic infection had been often attributed to gonorrhœal infection and to exposure of the patient to insanitary surroundings before labour set in; but his experience was that, provided antiseptic precautions were efficiently carried out and asepsis maintained during labour and afterwards, both the gonorrhœal infection and the previous insanitary conditions were rendered inoperative, and never led to severe septic infection. In his opinion the possibility of autogenetic infection need have no terrors for the obstetrician when antiseptics were efficiently employed.

Dr. ARNOLD LEA had carried out a similar investigation in 18 consecutive cases of severe puerperal infection, and with much the same result as the authors of the paper. He had also examined the blood in 14 of these cases. In two cases only were streptococci discovered, and both ended fatally. He believed that in many cases of fatal infection the blood remained free from streptococci. In these cases the infection was mainly lymphatic and the blood remained sterile. This was especially frequent in the acute and rapidly fatal types, and might account for the frequent failure of the serum treatment; the streptococci developed in the lymphatic vessels and tissues of the pelvis, producing toxæmia, but the serum was powerless to act directly upon them as it could only be injected into the blood stream. He did not consider that the use of the curette was contra-indicated in puerperal infection. It was a much more efficient method of cleansing the uterine cavity than the finger. But it should be done early and thoroughly.

Mr. FOULERTON, in reply, explained that most of the cases which were clinically included under the term "sapræmia" fell into the pathological category of local infection plus toxæmia, occasionally with general infection superadded. He though it unlikely that M. gonorrhœa, yeast parasites or streptothrices had been overlooked in any of his cases. Too much importance had, he felt sure, been attributed to M. gonorrhœa as a cause of puerperal infection. Both he and Dr. Bonney held very strongly that an immense proportion of the cases of streptococcic puerperal fever

were avoidable, and the more nearly the conditions of general obstetrical practice approximated to those of a properly conducted lying-in hospital the less frequent would streptococcic infection be, and the lower the mortality from puerperal fever. Active curetting of the uterus in puerperal infections could not be justified, for if limited to the surface the operation would facilitate in every possible way deeper infection of the wall of the uterus and increase the mischief; and if the wall were already deeply involved no operative interference short of hysterectomy could remove the cause of infection. While recognising the difficulties associated with serum treatment, there could not be any doubt in his mind but the anti-streptococcic serum did act as a specific cure in some cases of puerperal fever.

Vaginal Hysterectomy in the Puerperium for Sepsis, Due to Suppuration of Myoma.

Dr. Arnold Lea read this paper. Curetting was performed without beneficial result. Pyrexia continued with occasional rigors. There was no peritonitis. The uterus was removed by means of ligatures *per vaginam* 7 weeks after delivery. Both uterine appendages and a portion of omentum, all of which were implicated, were removed at the same time A glass vaginal drainage tube was used. The temperature fell to normal within a week, complete recovery following. Pus from the tumour showed streptococci and B. coli communis.

Dr. Russell Andrews mentioned a case in which he performed abdominal hysterectomy three days after delivery on account of pyrexia and pain due to a fibroid as large as an adult head, which was undergoing central necrosis. The patient made a good recovery. He agreed that the vaginal route was to be preferred in such cases if the fibroid was not too large.

Dr. Boxall said that even the removal of an infected uterus sometimes failed to cut short the sepsis and to cure the patient. *Post-mortem* examinations on patients who had succumbed to puerperal sepsis showed why in many cases this result was to be expected. For in many cases there was implication of the venous and lymphatic plexuses, and foci of infection formed beyond the uterus which rendered it impossible to completely get rid of the whole source of the trouble even by opening the abdomen and removing the uterus. As a result septic infection often continued to spread and a fatal result followed.

BRITISH GYNÆCOLOGICAL SOCIETY.

Annual General Meeting, January 12th, 1905, Professor John Taylor, *President, in the Chair.*

The following officers were elected for the current year:—

Hon. President. R. Barnes, M.D., F.R.C.P., F.R.C.S.

President. William Alexander, M.D., M.Ch., F.R.C.S. (Liverpool).

Vice-Presidents. E. Stanmore Bishop, F.R.C.S. (Manchester); Bedford Fenwick, M.D., M.R.C.P. (London); F. Bowreman Jessett, F.R.C.S. (London); R. P. Ranken Lyle, B.A., M.D., B.Ch. (Newcastle-on-Tyne); Sir A. V. Macan, M.A., M.B., M.Ch., M.A.O., F.R.C.P. (Dublin); J. Jameson Macan, M.A., M.D. (London); H. Macnaughton-Jones, M.D., F.R.C.S.I.

(London); Christopher Martin, M.B., C.M., M.R.C.P. (London); J. A. Mansell-Moullin, M.A., M.B., M.R.C.P. (London); Thomas Oliver, M.A., LL.D., M.D., F.R.C.P. (Newcastle-on-Tyne); Heywood Smith, M.A., M.D., M.R.C.P. (London); W. Dunnett Spanton, F.R.C.S. (Hanley).

Hon. Treasurer. W. H. Slimon, M.D., F.F.P.S. (London).

Council. T. Gelston Atkins, B.A., M.D., M.Ch. (Cork); N. T. Brewis, M.B., C.M., F.R.C.P., F.R.C.S. (Edinburgh); G. Roe Carter, M.R.C.P.I. (London); Sir J. Halliday Croom, M.D., F.R.S.E. (Edinburgh); William Duncan, M.D., M.R.C.P., F.R.C.S. (London); F. Edge, M.D., M.R.C.P., F.R.C.S. (Wolverhampton); George Elder, M.D., C.M. (Nottingham); T. J. English, M.D. (London); J. H. Ferguson, M.D., F.R.C.P., F.R.C.S. (Edinburgh); Clement Godson, M.D., M.R.C.P. (London); Arthur Helme, M.D., M.R.C.P. (Manchester); R. J. Kinkead, A.B., M.D. (Galway); J. Macpherson Lawrie, M.D. (Weymouth); Samuel Lloyd, M.D. (London); John Padman, M.R.C.S. (London); Ernesto Pestalozza, M.D. (Florence); J. J. Redfern, M.A., M.D., M.Ch., M.A.O. (Croydon); Charles Ryall, F.R.C.S. (London); R. T. Smith, M.D., M.R.C.P. (London); J. H. Swanton, M.A., M.D., M.Ch., M.R.C.P. (London); J. W. Taylor, M.Sc., M.D., F.R.C.S. (Birmingham); W. Travers, M.D., F.R.C.S. (London); H. F. Vaughan-Jackson, M.R.C.S., L.R.C.P. (Potter's Bar); Hugh Woods, B.A., M.D., B.Ch., M.A.O. (London).

Editor of the Journal. J. J. Macan, M.A., M.D. (London).

Assistant Editor. J. Hutchinson Swanton, M.D.

Hon. Secretaries. Sol. Jervois Aarons, M.D., C.M., M.R.C.P.; Smallwood Savage, M.A., M.B., B.Ch., F.R.C.S.

Auditors. C. H. Bennett, M.D.; F. A. Purcell, M.D.

Trustees of the Property of the Society. G. Granville Bantock, M.D., F.R.C.S.; R. S. Fancourt Barnes, M.D., F.R.S.E.; Clement Godson, M.D., M.R.C.P.

Dr. Inglis Parsons showed a *Double Pyosalpinx* symmetrically enlarged on each side, and removed without any rupture. Even in the presence of dense adhesions, by taking time and separating the adhesions from behind and below, he found it often possible to isolate and remove both tubes without rupture.

The President then delivered his

Valedictory Address.

After reviewing the progress of Gynæcology during the last year, and alluding to the loss the profession had sustained from the deaths of many eminent men, he mentioned that his association with the Society, of which he became a Foundation Fellow more than twenty years ago, was coterminous with his work as an operating gynæcologist. During that time he had performed 1,291 operations with only 85 deaths, a total mortality of 6·5 per cent. But many of the deaths were unavoidable or only indirectly due to operation. One was from apoplexy; four were cases of acute perforative peritonitis, one of which was a Cæsarean section with a child now still alive; four were moribund cases of intestinal obstruction, and twenty-two patients died rather from malignant disease than from the results of the operation. He had, however, to regret some early cases of sepsis and one from secondary hæmorrhage. Some cases also of myoma, operated on by the modified clamp operation, might no doubt have been saved by more modern methods. Taught by experience, his best work had been in the last five or six years which, including a fair proportion of

grave cases, showed a mortality of only 1 per cent. His experience extended over days of ignorance when hardly anything was left undone that favoured infection, over days of empirical asepsis and the more recent ones enriched by our acquired knowledge. He attributed the greatest advantage to the recognition of the efficiency of heat in sterilisation, to the disinfection of the hands by permanganate of potash supplemented by spirit and biniodide of mercury, not only before operation but after every dangerous contact; and to the substitution of fine interlocking chain sutures of silk for ligature *en masse*. Fine silk he had found to be in time as perfectly absorbed as catgut. Pelvic hæmatocele, the so-called broad ligament hæmatoma, formerly the commonest complication of post-operative convalescence, though attributed to the use of a sharp needle, he had not found to be so. It was more probably due to ulcerative erosion of the vessels owing to infection from the thick silk used in tying the pedicle. The removal of the appendages for myoma he had gradually, though not entirely, abandoned in favour of abdominal or vaginal hysterectomy, and he now seldom performed that operation for gonorrhœal tubal disease, preferring systematic treatment with biniodide of mercury, which even in cases demanding interference when combined with the evacuation of the sacs and drainage, was generally better than the old operation. In inguinal colotomy by Reclus's method, by tying off a small amount of mesentery at each side of the spigot of glass at the original operation, he found that the subsequent division of the intestine was practically bloodless and not accompanied by arterial hæmorrhage, as otherwise was too often the case. In conservative operations some of his greatest successes had been the operation of adnexal adhesions to the intestines causing obstruction; hysteropexy and ventro-suspension were also conservative, but he had found conservative operations on the appendages disappointing; simple prolapse of the ovary due to retro-displacement was best treated by shortening the round ligaments without opening the peritoneum. Disliking all forms of fixation, he had abandoned anterior colpotomy, but had become more and more attracted by posterior colpotomy, the advantages of which were not to be overlooked even in virgins or children. The essential point in the operation after the disinfection of the vagina was free drainage with iodoform gauze. Vaginal ovariotomy and vaginal enucleation demanded increasing consideration.

NORTH OF ENGLAND OBSTETRICAL AND GYNÆCOLOGICAL SOCIETY.

Meeting held at Manchester, Friday, December 16th, 1904, Sir WILLIAM SINCLAIR, *President, in the Chair.*

The following specimens were shown by Professor H. BRIGGS (Liverpool): *Tubercular Salpingitis* with vesico-intestinal fistula and pyelo-nephritis. The patient, single, 38, dressmaker, had been in failing health for 6 years. Then a tubercular gland was removed from her neck. Two years later, she had amenorrhœa for a year. During the last 12 months the menses had occurred every eight weeks, lasting from one to three days. For six months flatus and fæces had been passed from the bladder at varying intervals, mainly when the bowels were loose. The fistula lay amidst a densely matted inflammatory mass binding together the bladder,

uterus and rectum. No information as to the state of the kidneys seemed to be within reach, the bladder being loaded with putrid contents. To divert the fæces by colotomy, or to drain the bladder by a vaginal cystotomy, ignoring the primary inflammatory mischief, was not considered expedient, and Dr. Briggs undertook reluctantly to remove the tubes, giving a very unfavourable prognosis to the patient's friends. At the operation the adhesions were awkward and embarrassing; the fistula was exposed and bladder and intestinal openings sutured. The fever present before operation became intensified, vomiting became severe and death took place in 48 hours. At the necropsy both bladder and rectum were found to be tight; pyelo-nephritis was present on both sides.

Dr. S. Buckley (Manchester) remarked on the difficulty often experienced in recognising the nature of tubercular salpingitis, and related instances.

Mr. Stanmore Bishop (Manchester) inquired if the cystoscope had been used. In his work on "Cystotomy," Fenwick laid stress on the funnel shape of the ureteral openings in tubercle when present.

Dr. Briggs said that he had attributed the lesion to tubercle, and the cystoscope or other means of examining the urinary apparatus would have offered, amid putrid bladder contents, no advantages.

Apoplectic Placenta. Professor Briggs exhibited water-colour drawings, made on November 26th, 1900, of a placenta with extensive intra-placental hæmorrhages. The obstetric history was as follows:—Mrs. C., aged 42 years, had shown alcoholic maternal taint between the ages of 30 and 36; pregnancies, seven; (1) girl born at full term; (2) abortion at 2 months; (3) and (4) miscarriages at 4 and 6½ months; (5) at 7½ months, a premature female, weight 2 lbs. 10 oz., reared by the aid of a Hearson's incubator; (6) at 6 months, male child, when the placenta shown was expelled. There had been five apoplectic placentæ in all. It was arranged with the patient's medical attendant that in the next pregnancy Tr. ferri perchloridi, m.x., and chlorate of potash, gr.v., should be administered. This treatment was followed by the birth of a living full-term male child which was now strong and healthy.

Chronic Salpingitis and Uterine Fibroids. The tubes were large, the right 2¼ in. in diameter, the left 2½ in.; the contents, mixed pus and blood, were semi-solid and tenacious. Ovaries were a little enlarged, otherwise normal. Uterine walls thickened to an average of an inch, and showed five small fibroids; endometrium thickened unevenly and regardless of the sites of the fibroids. The uterus was removed. The peritoneum was slightly thickened in the pelvis. Adhesions were few and confined to the abdominal openings of the tubes, which did not leak during or after separation. The infection must have been of a mild type to have produced so little thickening of the tubal walls. The contents of the tubes were reported to be sterile, *i.e.*, bacteriologically there was a negative result. Menstrual history: regularity from the commencement at 14. The interval began to increase two years ago. No period in February, period in March, then seven weeks' continuous bleeding. Hæmorrhage on June 9th, noted to be slight and red in colour. There was no evidence of tubercle in the patient, who was a pale moderately stout woman, aged 39.

Ovarian Fibroma with Large Cyst. Dr. Briggs stated that he had removed the tumour on the 14th November from a woman aged 25, who had borne two children during the six years of married life. The tumour had been known to the patient for 8 months, and had grown steadily since then. The whole tumour was pedunculated from the surface of the left

ovary, the pedicle measuring ½ in. in diameter. The solid part, one-sixth of the whole, was fibromatous and liver-shaped; it rested on the lower five-sixths, the cystic portion containing clear fluid. There was no ascites. Menses normal. Dr. Briggs alluded to his own experience of the more frequent absence of ascites than was generally supposed in cases of ovarian fibroma.

Dr. Lloyd Roberts (Manchester) remarked that in his experience of ovarian fibromata there had been some fluid in the peritoneal cavity in all cases.

The President observed that he might draw a distinction between solid uterine tumours and others of pelvic origin. If a tumour floated the presumption would be that it was a solid tumour of the ovary. In malignant disease it was not usual to find firm smooth-surfaced growths. He thought hydroperitoneum was almost pathognomonic of fibroid of the ovary.

Dr. A. Donald (Manchester) agreed that with large fibroid tumours of the ovary, hydroperitoneum was present, usually as the result of irritation.

Dr. J. M. H. Martin (Blackburn) thought that whether fluid was present or absent depended on the position of the tumour and on the relations of its vessels. When there was no venous obstruction fluid was not found.

Professor Briggs related a case of *Uterine Fibroids and Corporeal Cancer*. A childless woman, aged 55, who had married at 48, stated that after the age of 50 the menstrual loss became excessive. At 53 there were clots and losses of longer duration. At 54 the discharge became continuous as a large quantity of fœtid pus. In November, a solid substance the size of an egg was expelled, and the expert report obtained described the mass as a portion of a fibroid. Clinically there was a large uterine growth reaching just above the umbilicus, nodulated externally and suppurating within; there was fœtor, and fever, emaciation, and general ill-health were present. Abdominal supra-vaginal hysterectomy was performed and was followed by a normal convalescence. After-history: May 9th, 1904, excision of papillomatous growth just inside fourchette and an enlarged left inguinal gland. October 10th, 1904, excision of papillomatous growths, several in the cervical canal, a small one in the vagina and a right inguinal gland. Cervix and rest of these excised. November 25th 1904, removal of following growths, together with the normal left ovary and tube, papillomatous cyst of right ovary, extending its growth into the mesosalpinx, small growth in vaginal vault, and in lower third of vagina on the right. It was then found that the disease had spread into the right broad ligament beyond the reach of safe surgery. The history of the case suggested that where fibroids and cancer of the body of the uterus co-exist, a radical operation might require to have wider limits than those set by the uterus itself; for in this particular instance where the clinical and pathological features were entrusted to separate persons and where the clinical history was so consistent with fibroids, even supposing there had been a panhysterectomy, there would have been the vaginal growths and the ovarian tumour. Careful search made before and during the first operation failed to reveal malignant disease. The patient was slowly losing ground.

Dr. Lloyd Roberts discussed the case.

The President, Sir William Sinclair, then delivered the Presidential Address, taking as his subject the home attendance on puerperal women in

large centres of population, and treating the matter from the points of view of medical men and of midwives. The Address will be published in full.

Dr. Lloyd Roberts moved a vote of thanks to Sir William Sinclair for his address. This was seconded by Dr. J. W. Martin, supported by Dr. John Scott, and carried unanimously.

GLASGOW OBSTETRICAL AND GYNÆCOLOGICAL SOCIETY.

Meeting 21st December, 1904, Dr. J. K. Kelly, *President, in the Chair.*

The business of the meeting was a discussion on the

Treatment of Prolapse of Uterus,

introduced by Dr. W. L. Reid.

Dr. Reid spoke first of the more chronic forms of prolapse, dwelling upon prophylaxis as being important. In milder forms of prolapse a pessary was often curative more especially that of Albert Smith. When operative treatment was necessary the most suitable operation was that of amputation of the cervix with repair of perinæum, together with anterior and posterior colporrhaphy. Fixation of uterus to the anterior abdominal wall was also necessary in some cases.

Dr. Munro Kerr was impressed with the disadvantages of the watch-spring pessary, as becoming septic so quickly from the vaginal discharges. He also considered it of benefit having a strong pelvic floor when repairing the perinæum.

Dr. Balfour Marshall remarked that in those cases of hypertrophy of the median portion of the cervix a pessary was of use in causing shortening.

Dr. Edgar had some experience of paraffin injection, but considered it as somewhat dangerous owing to subsequent pulmonary embolism.

Dr. Scott McGregor had tried paraffin injection once with failure.

Dr. Douglas spoke as to Martin's method of procedure.

The President remarked that he seldom did a colporrhaphy when doing ventro-fixation.

EDINBURGH OBSTETRICAL SOCIETY.

Meeting, Wednesday, February 11th, Prof. A. R. Simpson *in the Chair.*

Dr. Freeland Barbour read a paper on Climacteric Hæmorrhage Due to Sclerosis of the Uterine Vessels. He pointed out the importance of recognising the causes of hæmorrhage at or near the menopause, and recorded a case of severe hæmorrhage lasting for sixteen weeks in a multipara, aged 46, for which panhysterectomy was performed. The only lesions found on subsequent examination of the uterus were thickening and sclerosis of the capillaries of the mucous membrane and of the arteries of the muscular wall. The literature of the subject was reviewed and similar cases recorded by Bland-Sutton, Reinecke, and others were summarised.

Dr. BARBOUR indicated the distinction between these cases and those of "apoplexia uteri" recorded by Cruveilhier and others.

Dr. SCOTT CARMICHAEL read a paper on THE APPLICATION OF BIER'S HYPERÆMIC TREATMENT TO GYNÆCOLOGICAL DISEASE. He first of all made reference to its use in general surgical conditions and described the mode and method of application. He pointed out the kind of gynæcological cases most benefited by its use. In conclusion, Dr. Carmichael stated the contra-indications and the dangers in certain cases.

Dr. BARBOUR SIMPSON read a paper on A CASE OF FATAL COMPLETE IRREDUCIBLE PROLAPSUS UTERI, and showed the specimen.

REVIEWS OF RECENT BOOKS.

MANUAL OF DISEASES OF WOMEN. By H. Macnaughton Jones, M.D., M.Ch., Formery University Professor of Midwifery and Diseases of Women and Children in the Queen's Hospital, Cork. Ninth Edition. London: Baillière, Tindall and Cox. Pp. 1,044, 637 illustrations and 125 plates.

The fact that this manual has now reached its ninth edition must be taken as a proof that it has been found useful by a large class of readers. The author tells us that the present edition has been practically rewritten, in order to bring it up to date and to keep it abreast of the many advances in gynæcology which the last few years have brought forth. There is no doubt that this has been most thoroughly done, for extracts of many very important recent papers are included in the text, and one does not look in vain for references to recent work in almost every branch of gynæcology. Taking the work as a whole, it is of a distinctly practical nature, and the majority of the chapters on treatment are well written, include a digest of the methods pursued by the leading Continental and American authorities, and stand out pre-eminently as the parts of the book which will most appeal to readers. At the same time we should have welcomed the deletion of many of the forms of treatment of endometritis and erosions of the cervix by means of mild caustics and intra-uterine medication. The author speaks in scathing terms of "cotton-wool gynæcologists" in one place, but at the same time preserves much of the tinkering methods of treatment of the last generation. It is in the realm of pathology that we find the book most unconvincing, and especially so with regard to the minor diseases with which the gynæcologist is confronted, such as subinvolution, cervical erosion, endometritis and prolapsus uteri. Under the heading "Development of Ovarian Cysts" the author gives us the conclusions of an American lady observer, amongst which we find the following:—"No ovarian cyst, small or large, exists without a previous oöphoritis," a statement which simplifies exceedingly the very difficult question of the origin of ovarian cysts, but one which is made on most unconvincing grounds. Beyond this no theory of any kind is quoted. Probably, however, pathological questions are not of great interest to the majority of practitioners, and so we may predict that the book will continue to be popular with them; but we cannot recommend it to the student as a text-book, from which he might hope to pass examinations.

THE PREPARATION AND AFTER-TREATMENT OF SECTION CASES. By Stewart McKay. London: Baillière, Tindall and Cox. pp. XX and 651. Illustrations 134. Royal 8vo. Price 15/-

This book is intended to be "a help to the young surgeon." The author means "abdominal section" when he uses the word "section," so the scope of the book is not so wide as the title would suggest. Whether or not it is worth while to write a book of 651 pages on the preparation and after-treatment of abdominal section cases is a matter that concerns the writer, not the reviewer. A very minute account is given of the preparation of instruments,

dressings, the patient and the operating room, with a description of all possible complications and sequelæ of abdominal section. Much of this is excellent, some of it somewhat unnecessary. In the latter category we would put the picture of a towel-horse on p. 169.

The author was one of the late Mr. Lawson Tait's assistants, and the book contains no less than 37 references to his teaching. The author records a fact about calomel which is not often mentioned in text-books though most men find it out for themselves, viz.: that pure calomel by itself has very little purgative effect.

In describing the different ways of guarding against the possibility of leaving a gauze pad in the abdomen, no mention is made of the simple plan of having a piece of silk sewn on to each pad, and fixing a pair of Spencer Wells' forceps to this before the pad is inserted. In describing the selection of instruments for abdominal hysterectomy the author says, "a pair of midwifery forceps may be useful in dealing with pelvic fibroids." We think the majority of operators would prefer a corkscrew. A curious suggestion is made as to the ætiology of parotitis after abdominal section, viz.: that the anæsthetist may have something to do with it by pushing the jaw forward.

The book contains a great deal of useful information and interesting accounts of the different methods employed by well-known operators all over the Continent, and so should be of use not only to the young surgeon but also to those of riper years. We fancy however that it will be used more as a book of reference than as a hand-book. It is well illustrated and contains numerous useful charts.

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